

ARMY RESEARCH AND DEVELOPMENT



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R&D Functional Realignment Progressing

Theme of the Month

By the Honorable Wilber M. Brucker
Secretary of the Army

The establishment of the *Army Research and Development News-magazine* augurs well for the achievement of closer communication among the many agencies which are striving to apply the latest developments in science and technology to the defense and progress of the Nation.

In an age when the soldier relies on advanced technology for almost everything he requires to play his indispensable role with maximum effectiveness, it is imperative that professional men in every branch and component of our "One Army" keep fully abreast of progress in the whole busy, vital field of research and development. Not only should they know how to use the weapons and equipment currently

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Realignment of functions directed by the Secretary of the Army to enhance effectiveness and expand capabilities of the Army R&D program through increased authority and control vested in the Chief of Research and Development is nearing completion.

Based on findings and recommendations contained in the voluminous Rod-erick Board report, readjustments are in harmony with mid- and long-range Army research and development program objectives. Purpose: To get maximum results in the minimum time—with the accent on TIME.

Created Nov. 23, 1959, as a result of the efforts of Mr. Richard S. Morse,

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U.S. Science Mission to Uruguay Results in Building a Bridge

Rail traffic again moves across the Quequay River, Uruguay, on a bridge built by the Uruguayan Government with cooperation of the United States to replace a span washed out by floods. In-structed by a technical advisory team from the U.S. Army Engi-neer School, Fort Belvoir, Va., 125 men of the Uruguayan Army erected the Bailey bridge with 300 tons of equipment provided by the Marion (Ohio) Engineer Depot through the U.S. Inter-national Cooperation Administration. Replacement was a di-rect result of a U.S. Science Mission visit in 1959 under State Department auspices, set up by the Army Research Office, as directed by the Chief of R&D, Department of the Army.





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Objectives of this publication are: To improve informal communication among all segments of the Army scientific community and other Government R&D agencies; to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

Picture Credits: Unless otherwise indicated, all illustrations are by the U.S. Army.

Submission of Material: All articles submitted for publication must be channeled through the technical liaison or public information officer at installation or command level.

Back Cover: Installation of portable nuclear power plant, believed to be world's first, at Camp Century, the Army's undersnow installation about 800 miles from the North Pole. When operational, plant will supply electricity for power, heating and lighting, and produce heat to melt subsurface snow for camp water supply. Plant is now undergoing exhaustive tests.

THEME OF THE MONTH

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issued in their branch, they should know what items are due for replacement and why they are being replaced. They should also be aware of research and development activities in other arms and services. Above all, even before new equipment is in their hands, they should be prepared to integrate it with new techniques and doctrine.

Every man, especially those responsible for planning and leadership, should be governed by the fact that any new item, good though it may be, has but a transitory value in this day of unlimited scientific horizons. He must be prepared to depart from the old way of doing things—to approach every task with a mental attitude that seeks to stay always a step in advance of the newest piece of “hardware.”

It is perhaps unfortunate, but nevertheless true, that every scientific triumph today must be examined from the standpoint of its usefulness to national defense, viewed in the larger perspective of our Nation's total struggle to win over the perils which confront us in this era of international conflict. This has become necessary because America is faced today with the most formidable challenge in her entire history—the challenge of the implacable communist conspiracy. Frankly and openly dedicated to ruthless conquest and regimentation, militant communism has already traveled a long way toward its goal, and its leaders blatantly prophesy that democracy will eventually fall into their hands “like an overripe fruit” or that they will “bury” us.

Working almost solely in support of the Soviet Union's massive land, sea, and air forces is a legion of regimented scientists, laboring under the watchful eye and purposeful direction of the communist dictatorship. The Kremlin can deny its people virtually every comfort and convenience of life in order to concentrate its full scientific and industrial potential upon those undertakings which best promote its selfish interests and advance it toward its goal of world domination.

Here in the United States we place the highest premium on open competition and free enterprise. Free men, recognizing their dependence one upon the other, voluntarily contribute their time, effort, and skill for the common good, while reserving their natural privilege to earn a share of profit, prestige, and self-respect for themselves. This Nation has long realized that its greatest resource is the creative genius of its citizens, and that the creative spirit could never thrive in chains or under a whip.

We believe our way is superior. But to preserve this superiority, our free enterprise—in science as in every other phase of our economic and social life—must rise to the challenge and outdo the best efforts of the regimented science and industry of the Soviet Union. It must voluntarily assume the obligation to put the national interest first, no matter what else may be left undone. It must not allow the desire for profits or creature comforts to assume greater influence in its plans and activities than the desire to serve the Nation faithfully and well.

In the Army we have already made notable progress along these lines. We have organized an Army-science-industry team whose combined skills, resources, and experience are unmatched in history. We are capable of achieving any goal that may be set in the defense of the Nation, and from our efforts will come, as in the past, tremendous collateral benefits to our people.

Our greatest potential enemy in this connection is complacent self-satisfaction. We can never rest on our laurels—never settle for the “pretty good” or the “half done.” We must go the whole way. To those who would travel the long, hard road of progress in assuring the security of our Nation, I commend this and future issues of this new publication in the full confidence that it will assist you in maintaining your professional competence at the constantly high level which the vital mission of our Army demands.

MISSILE MASTER Warns 10 Key Defense Areas

Completion of the MISSILE MASTER Fire Distribution and Control System this month at the Philadelphia site, the last of the large defense areas currently scheduled to receive such a system, extends the Army's “big electronic umbrella” protection against hostile aircraft over the ten most important critical areas.

Similar coverage is provided to the Seattle, New York, Boston, Niagara-Buffalo, Chicago, Los Angeles, Pittsburgh, Detroit and Washington-Baltimore areas.

The MISSILE MASTER was developed by

the U.S. Army Signal Corps in conjunction with the Martin Company's Orlando Division to provide an efficient and economical means to control and distribute defense artillery fire against hostile aircraft.

Electronic fire direction coverage will soon be extended to cover additional areas throughout the United States through the installation of the AN/GSG-5 and AN/GSG-6 Air Defense Artillery Fire Distribution and Control Systems, designed to meet the needs of the small-to-medium size defenses.

R&D Functional Realignment Progressing

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Director of Research and Development, Department of the Army, the 7-man Roderick Board (named after its chairman, Assistant Secretary of the Army George H. Roderick), submitted its report in mid-June 1960.

In a July 30 memorandum to the Chief of Staff, Secretary of the Army Wilber M. Brucker said, in part:

"The Roderick Board has completed its report, and I have carefully reviewed its recommendations together with your recommendations and those of all other interested senior officials of the Secretariat and the Army Staff.

"As a result of my review, I have determined that certain procedural and organizational changes should be made in existing practices in order to establish a line of responsibility and authority from the Chief of Research and Development to the Chief of the Technical Services, on matters of research and development, parallel to the existing line of authority and responsibility from the Deputy Chief of Staff for Logistics to the Technical Services in matters of logistics.

"In carrying out these increased responsibilities, the Chief of Research and Development will continue to operate under the functional policy supervision of the Director of Research and Development. . . ."

26 Changes Outlined

Secretary Brucker's memorandum carried a 5-page attachment setting forth 26 changes that he desired to have initiated "with the least practicable delay." Under the direct supervision and control of the Chief of Staff, the Chief of Research and Development was given Army staff responsibility for:

"Planning, coordinating, directing and supervising all Army research, development, test and evaluation including all controls over R&D policies, funds and manpower (within overall Department of the Army policies) which are essential to the discharge of this responsibility. . . ."

The memorandum further stated that:

"The Chiefs of the Technical Services shall establish clearly delineated channels between their respective R&D chiefs and field installations engaged in R&D work to insure prompt and effective response to program and policy determinations by the Chief of Research and Development. . . ."

CRD Given Manpower Control

From the viewpoint of some 25,000 civilian and officer career scientists, engineers and technicians engaged in

the Army's in-house R&D activities, an important provision stated that the Chief of Research and Development:

"Exercises manpower control over military and civilian personnel spaces in the Technical Services engaged in research and development activities. In this respect, spaces for civilian personnel filling R&D positions at the technical service level, including spaces for personnel working on research and development activities under the Army Industrial Fund, will be bulk-allotted to the Chief of Research and Development by the Deputy Chief of Staff for Personnel.

"Sub-allotment will be made to the Technical Services by the Deputy Chief of Staff for Logistics as prescribed by the Chief of Research and Development. Personnel spaces so allotted will not be assigned or transferred to other than research and development activities without prior approval of the Chief of R&D. . . ."

"Action [will] be intensified to estimate future qualitative and quantitative personnel requirements arising from the development of new concepts and materiel and to insure that this information is systematically utilized so that realistic advanced planning can be conducted for the Army's future manpower needs. . . ."

Tech Services Recommend PL313's

"On RDT&E PL 313 super-grade positions, recommendations of the Chiefs of Technical Services will be submitted directly to the Chief of Research and Development, thence through the Director of Research and Development to the Assistant Secretary of the Army (Manpower, Personnel and Reserve Forces). (This eliminates the channel now existing whereby such requests are made to the DCSLOG.) . . ."

Among other significant provisions of Secretary Brucker's memorandum currently being implemented are:

"Human factors research will be more closely related to and coordinated with the development of materiel. . . ."

"The Chief of Research and Development [will] improve the system and procedures for advising industry and the scientific community of the materiel objectives and requirements of the Army. . . ."

Long-Range Planning Stressed

"The Deputy Chief of Staff for Operations will give increased emphasis to projecting planning further into the future in order to take early advantage of the very long-range thinking and forecasting of the scientific community. . . ."

"The Deputy Chief of Staff for Logistics, the Deputy Chief of Staff for Per-

R&D Division Formed At Redstone Arsenal Calls for Staff of 1,000

A Research and Development Division, with a planned staff of 1,000 and an estimated budget of \$216,328,000 for Fiscal Year 1961, has been established within the Army Ballistic Missile Agency at Redstone Arsenal, Huntsville, Ala.

Formation of the new Division was announced by Maj Gen August Schomburg, Commanding General, Army Ordnance Missile Command. It replaces the Development Operations Division, transferred July 1 to the National Aeronautics and Space Administration, and is concerned with the following missile and rocket systems: Redstone, Jupiter, Pershing, Nike Zeus Target, Honest John, Littlejohn, Corporal, Sergeant, Missile A, Missile B, Light Anti-Tank Weapon (LAW) and special weapons.

The organization retains the AMBA's unique in-house capability in developing the Army's surface-to-surface guided and free-flight missiles. In addition to the Office of the Director, the R&D Division consists of six laboratories, four project offices, two coordination offices and an administrative office.

Director of the Division is Dr. Arthur Rudolph, project director of the Redstone and Pershing systems under the Development Operations Division. The deputy director is Lt Col Lee B. James, and John L. McDaniel is technical director.

sonnel, and the Assistant Chief of Staff, Intelligence, [will] give greater emphasis to and expand their activity and capability in the field of combat developments and in the area of long-range planning as it affects the research and development efforts. . . ."

Findings of the Roderick Board did not come as a surprise to Army R&D leaders. The Board's report made a matter of record (thereby providing a requirement for remedial action) what had been long and generally recognized.

In the five years since the Office of the Chief of Research and Development was established, on Oct. 10, 1955, Army R&D expanded phenomenally in response to continued world crisis and the international scientific and technological explosion. Traditional alignment of functions and responsibilities within the Technical Services and DCSLOG hindered the new R&D management in keeping pace with the fast changing requirements for centralized control standards of the type now being effected to achieve overall aims.

Top Officials of Army R&D Explain Purposes Of Newsmagazine, Urge Complete Cooperation

Whatever approbation may be merited by this introductory issue of the *Army Research and Development Newsmagazine* should redound rightfully to the credit of Technical Liaison Officers and their staffs, the many persons who offered helpful suggestions, and the voluntary contributors of special articles.

Success of the *Newsmagazine* in serving the purposes for which it is designed will be in direct ratio to the cooperation given by TLO staffs, scientists, engineers, technicians, and administrators in furnishing news or special articles pertinent to the interests of the many thousands of workers in the vast complex of the Army scientific community.

The *Newsmagazine* does not have staff writers who can be temporarily assigned to field installations to prepare feature articles or timely reports on significant progress in Army research and development activities. The limited staff, physically located at Army Research Office Headquarters in Arlington, Va., permits only editing and rewriting, as may be necessary to meet style requirements, of information submitted from the field.

Director Morse's Statement

Relative to the objectives of the *Newsmagazine*, Mr. Richard S. Morse, Director of Research and Development, has stated:

"We at the management level of Army R&D have long recognized the essentiality of a periodical publication to improve communication, informal in nature, among all elements participating in a program that reaches into virtually every State, most of the nations in Free Europe, the Far East, and is currently being extended to Latin America.

"Of necessity, in response to increasing world tensions in recent years, the Army research and development program has expanded amazingly, in volume and in diversification of scientific interests. The urgency of the Nation's military preparedness requirements and the Army's key role in meeting the most immediate needs, in addition to producing new weapons systems to provide superiority far into the future, point to the importance of many types of communication. Adequate coordination and fully effective cooperation throughout as large and widely diffused an organization as Army R&D are attainable only by using many communication mediums.

"The *Army Research and Development Newsmagazine* is the result of a

long considered analysis of the problem of maintaining more effective communication within the Army R&D establishment and with other Government agencies directly or indirectly contributing to the success of our program. The *Newsmagazine* is especially designed for a specific and well recognized requirement.

"Properly supported by submission of pertinent information from all Army R&D activities, this monthly periodical should perform a most valuable service in presenting reports on significant gains, overall progress and objectives, the views or policies of management, measures being taken to cope with problems of interest to all personnel, and accounts of how people are accomplishing their jobs and gaining deserved recognition."

General Trudeau's Statement

Lt Gen Arthur G. Trudeau, Chief of Research and Development, commented on his keen personal interest in the *Newsmagazine*, saying:

"Many commercial publications are doing a fine job of reporting on what they consider newsworthy results of Army research and development insofar as they are designed to appeal to large segments of readers, or to satisfy specific interests of professional and scientific groups.

"From our viewpoint, however, none of the commercial publications has attempted to present, specifically for the audience toward which the *Newsmagazine* is directed, a broad picture of the overall depth and scope of the Army research and development program—or to fill a very real need for dissemination of the special kinds of information our new publication will contain. It should be clear that the *Newsmagazine* is not intended to compete with professional journals or other commercial news media.

"My desire is that the *Newsmagazine* will be able to furnish, through the complete cooperation of all agencies and individuals concerned, the kind of information that will build pride of service, stimulate unity of purpose, and help to eliminate duplicatory or wasteful rivalry. Its aim will be to improve understanding of problems related to our mission and to foster teamwork in planning, integrating, and coordinating our program. It will reflect the Army's desire to blend its program with all of the Nation's other R&D activities, insofar as is practicable, in solving problems of building military strength expeditiously."

AKS Deliberate Thorny Problem At Natick Parley

"Optimum Planning and Forecasting of Army Research Programs into the Future" was the subject of lively discussion at the Tenth Meeting of Army Key Scientists, attended by about 90 Army R&D leaders, at Headquarters of the Quartermaster Research and Engineering Command, Natick, Mass., Nov. 1-3.

Sponsored semiannually by the Chief of Research and Development, meetings of Army Key Scientists are designed to give participants the opportunity of seeing first-hand, as an aid to future joint planning, the facilities and capabilities of major R&D centers. Seminar discussions produce recommendations implemented through staff agencies immediately concerned, following analysis and evaluation of reports of seminar findings.

Prior to the convening of the four panels selected to consider the seminar topic, it was discussed in presentations by Dr. James B. Edson, Senior Civilian Missiles Advisor to the Assistant Chief of Staff for Intelligence, DA; Col Allen T. Stanwix-Hay, Deputy Chief, Requirements Division, Office of the Deputy Chief of Staff for Logistics, DA; and Col George T. Metcalf, Chief, Plans Division, Combat Developments Section, Headquarters U.S. Army Continental Command.

Dr. Harold C. Weber, Chief Scientific Advisor, OCRD, presided as chairman. Dignitaries participating included Dr. Edward G. Witting, Deputy Director of Research and Development, DA; Brig Gen William J. Ely, Director of Army Research; Brig Gen Merrill L. Tribe, Commanding General, QM R&E Command, host for the meeting; Dr. Richard A. Weiss, Deputy and Scientific Director, Army Research Office; and the Chief Scientists of four of the Army's seven Technical Services.

Dr. George L. Haller, Vice President, General Electric Company, gave the key address, "Planning and Forecasting of Research Programs," at a banquet Nov. 1.

3 TC Employees Receive Awards

Sustained superior performance certificates and \$200 apiece were awarded recently to three employees of the U.S. Army Transportation Research Command (USATRECOM), Fort Eustis, Va., by Col John D. Crowley, Jr., USATRECOM Commander. The recipients: Mrs. Curtis B. Swofford and Mrs. William D. Johnson of the Technical Liaison Office and Mr. Ernest C. Wood, warehouseman leader.



Brig. Gen. Merrill L. Tribe, Commanding General, QM R&E Command, Natick, Mass., was host to Army R&D leaders who attended meeting of key scientists, Nov. 1-3.

ARTS Lists Status Of 2,900 Tasks

Status of nearly 2,900 Army research tasks conducted in-house, by contract or by grants to nonprofit institutions is reported in the new Army Research Task Summary (ARTS).

Now being distributed to Department of Defense and other Government agencies concerned, the Summary, for the first time, reports on tasks in progress at the close of a fiscal year, June 30, 1960. Formerly an arbitrary cutoff date (Sept. 30 in 1959) did not reflect the close of a calendar or a fiscal year.

Containing more than 3,000 pages of highly condensed information, separated according to scientific disciplines into six volumes, each with a classified supplement, the new ARTS shows an increase of 10 percent in number of tasks reported as compared with the previous Summary.

The breakdown of the ARTS according to scientific disciplines is: No. 1, Medical, Biological, Social and Behavioral Sciences; No. 2, Chemistry; No. 3, Physics (Part I); No. 4, Physics (Part II) and Geophysical Sciences; No. 5, Engineering; No. 6, Materials Technologies, Mathematics and Operations Research.

Compiled each year since 1955 by a George Washington University Task Group under direction of Col (USA-Ret) Harold P. Hennessy, the new ARTS shows the following participation in the Army program: total number of agencies, 724; Army in-house installations, 74; other Government agencies, 22; nonprofit institutions, 118; universities and colleges, 230; profit-making firms, 280.

Actions Directed Toward Improvements In Officer R&D, Atomic Energy Fields

Basic to the operational concept of Army research and development is teamwork at all echelons combining the skills of civilian scientists, engineers, technicians and career officers professionally qualified by advanced education or trained through experience in R&D problems and procedures.

Two noteworthy actions are directed toward widening the career vista of officers participating in the Army's R&D and Atomic Energy Programs. First is the recent establishment of a new officer position in the Office of the Chief of Research and Development (OCD), with the title of Assistant for Research and Development Officer Career Planning and Education.

Prime function of the officer in this post is to recommend policy and development of personnel plans to the Deputy Chief of Staff, Personnel (DCSPER) applicable to the AE and R&D Programs. He assists the Officer Assignment Division (OAD) DCSPER in the utilization of participants in these programs by identifying positions Army-wide which fall within the two career fields and in coordinating nominations of officers to fill OCD jobs.

Another important step is the initiation of a worldwide survey of Army positions in the R&D field, scheduled to get under way this month. Factors to be considered in the determining of a position as a key AE or R&D job are:

- (a) Incumbent should possess scientific civilian or military training in the AE or R&D field in addition to normal branch qualification.
- (b) Position which exerts significant influence on Army AE or R&D effort.
- (c) Position which requires incumbent to possess extensive AE or R&D managerial or supervisory experience at lower or higher command and staff levels.

The survey is being made by distribution of a TAG letter to field commanders requesting them to report on the existence of such positions within their commands. It is expected the project will be completed early in 1961, following which the list of such positions will be disseminated to participants in the program.

Explaining the thought behind the worldwide survey, Maj Strathmore K. McMurdo, first incumbent of the newly created career planning and education post, said:

"We intend to establish a firm career ladder for all officers with scientific training and experience and for those with managerial or supervisory experience in the AE and R&D fields. Having a comprehensive, up-to-date knowledge of existing positions in this area will help us in this effort. Meanwhile, we want such officers, present and future, to be aware that their careers

can lead them to key positions in the program, without prejudicing in the least their opportunities to advance in their particular career branches."

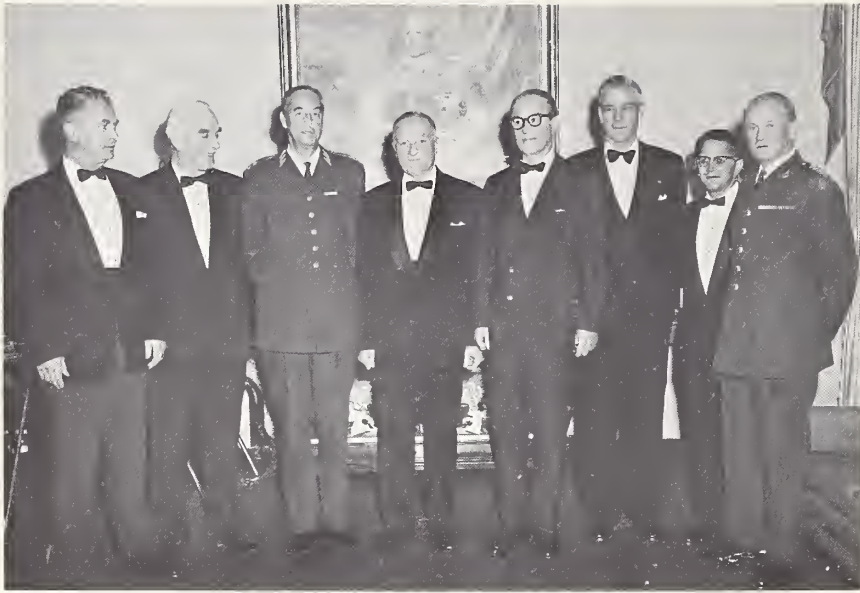
This protection of advancement opportunities within the career branches is virtually built into the research and development and atomic energy career programs. Qualified officers are encouraged to volunteer for these programs at any time after three years of active service. Subsequently, during the first 15 to 21 years of an officer's career, emphasis is placed upon a balanced development of the officer's maximum potential by alternating progressive branch and specialized assignments, together with progressive military and civil schooling.

During the later years of the career of an officer participating in the research and development or atomic energy career programs full utilization of his specialized training and experience will be made by consecutive assignments in the field of his specialty, requirements permitting. This is also occasionally permissible for unusually skilled officers who are in mid-career.

In managing the AE and R&D career programs special effort is made to encourage officers with graduate school backgrounds in science or engineering to volunteer. The purpose of this is simple: To enable the Army to capitalize to the fullest extent on scientific advances in the atomic and other technical fields.

Since the atomic energy program was started in 1953 a total of 172 volunteers have been accepted for participation. Of these 112, or 65 percent, have graduate degrees. The research and development career program, which started in 1954, has enrolled 261 volunteers, of whom 167, or 64 percent, have attended graduate schools.

"We are not trying to form a scientific corps of long-haired civilians in officer uniforms," said Lt Col Frank O. Fischer, Chief, Specialist Branch, Officers Assignment Division, Deputy Chief of Staff, Personnel, in commenting on the Atomic Energy and Research and Development career programs. "These programs are designed to provide a means whereby dedicated officers, technically trained and experienced primarily in the fields of Physical Sciences and Engineering, may volunteer for a career consisting largely of atomic energy and research and development assignments. The efforts and skills of these officers play a vital role in keeping the United States Army's hardware and weapon systems second to none in a fast moving technological race."



Noted Swedish biochemist Dr. Arne Tiselius (fourth from right) was a guest during his visit to Washington, D.C., of Lt. Gen. Arthur G. Trudeau, Chief of Research and Development, at the McNair Officers Club. Shown with Dr. Tiselius (left to right) are: Maj. Gen. O. N. Lodoen, Assistant Deputy Chief of Staff for Logistics; Maj. Gen. R. T. Nelson, Chief Signal Officer; Maj. Gen. M. S. Malm, Chief of Ordnance, Sweden; General Trudeau; Lt. Gen. J. H. Hinrichs, Chief of Ordnance; Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research; and Brig. Gen. Harald Jentzen, Director of Weapons, Army Ordnance Administration, Sweden.

Nobel Prize Winner Discusses Basic Research On Army Sponsored Visit to Technical Services

Internationally renowned Swedish biochemist Dr. Arne Tiselius, a Nobel Prize winner in 1948, conferred with Army scientists regarding basic research programs in a recent tour of Technical Service installations sponsored by the Chief of Research and Development, Department of the Army.

Director of the Institute of Biochemistry, University of Uppsala, Sweden, Dr. Tiselius' purpose in visiting Army installations was to discuss his latest work. He is performing special research for the Army in the fields of protein chemistry, electrophoresis and adsorption.

Following a full day at the Walter Reed Army Institute of Research, Washington, D.C., where he gave a 45-minute presentation on his work under an Army contract, Dr. Tiselius was the guest of Lt. Gen. Arthur G. Trudeau as a guest in the McNair Officers Club. Dignitaries of several Technical Services attended.

Included in the itinerary of Dr. Tiselius was a lecture before members and guests of the National Academy of Science, cosponsored by the Army. His subject was "Some Recent Advances in Methods for Separation of Submicroscopic Particles and Macromolecules in Bio-Chemistry."

While in Washington Dr. Tiselius toured the National Institutes of Health and the Naval Medical Research Institute. Before returning to Sweden in mid-October he met with scientists at the Quartermaster Research and Development Command, Natick, Mass.

DOFL Scientist Wins First Beckman Award

First winner of the Instrument Society of America's Arnold O. Beckman Award is Mr. B. M. (Billy) Horton, Army Diamond Ordnance Fuze Laboratory (DOFL) scientist recognized as a national authority on guided missile fuzing.

Presented at the society's annual meeting in New York City, the Award honored Mr. Horton for "his outstanding originality of professional achievement in the application of basic principles of fluid mechanics to the development of pure fluid elements."

Consisting of a plaque, citation and \$1,000, the Award was established by Beckman Instruments, Inc., Fullerton, Calif., as part of the firm's 25th anniversary observance and named in honor of the Society's 1952 President.

Mr. Horton is Chief of DOFL's Research Systems Laboratory.

Brucker Congratulates OCDR on Anniversary

Secretary of the Army Wilber M. Brucker noted a milestone in OCDR history on Oct. 10 by addressing the following letter to the Chief of Research and Development:

"Dear General Trudeau:

"On the occasion of the Fifth Anniversary of the creation of the Office of the Chief of Research and Development, I extend to you and your staff the congratulations and best wishes of the entire United States Army.

"In this revolutionary age of science and technology, the Army's Research and Development Program vitally contributes to the peace and security not only of the United States but of the entire Free World. It assures that the arsenal of freedom always will contain the best and most modern weapons and equipment that American ingenuity and resourcefulness can produce.

"In the few short years since activation of your office, Army Research and Development has drawn upon our Nation's great scientific and industrial resources with ever-increasing effectiveness to develop the hardest-hitting, fastest-moving Army in the history of the United States. Superb in every respect, our modern Army today testifies in particular to the excellence of the research and development efforts of these past five years.

"I am confident that the added authority recently given your office foreshadows even greater efficiency, economy, and accomplishment in the Army's research and development during the years to come.

"May you, your staff, and your hard-working partners in our Technical Services and American industry enjoy continued success in achieving the breakthroughs so essential to the future peace of this Nation and of the Free World."

Army R&D Heads Chosen

Department of the Army representatives on the newly constituted Aeronautics and Astronautics Coordinating Board are Mr. Richard S. Morse, Director, and Lt. Gen. Arthur G. Trudeau, Chief, Research and Development.

Composed of top management personnel and established by joint action of the National Aeronautics and Space Administration and the Department of Defense, the Board's purpose is: Review planning to avoid duplication; coordinate activities of common interest; identify problems requiring solution by either NASA or DOD and insure a steady exchange of information.

Dr. Herbert F. York, Director of Defense Research and Engineering, and Dr. Hugh L. Dryden, Deputy Administrator of NASA, are Board cochairmen.

ASAP: Effective Tool of Army R&D Leaders

In military parlance the logotype ASAP ordinarily stands for "As Soon As Possible," but for U.S. Army Research and Development personnel it carries a more far-reaching and important meaning—the Army Scientific Advisory Panel. Even spelled out, it frequently raises the question: What is the ASAP and what does it do?

The Panel is a group of 60 of the nation's leading scientists, engineers, industrialists and educators appointed by the Secretary of the Army to advise him, the Director of Research and Development, the Chief of Staff and the Chief of Research and Development on all scientific and technological matters of concern to the Army.

The Army does not trouble the Panel with budgetary problems, roles and mission troubles or strategic concepts. The ASAP goes into operation only when solution of research and development problems requires the comprehensive, or highly specialized, scientific and technological skills and resources represented within its membership.

With the exception of the Panel Chairman and Vice Chairman, two members at large and one member emeritus, Panel members are divided into eight subpanels: Air Mobility; Chemical, Biological and Radiological; Communications & Electronics; Firepower; Environmental Research; Ground Mobility; Human Factors; Management of Research and Development.

Two officers assigned to the Office of the Chief of Research and Development serve as the Executive Secretary and the Assistant Executive Secretary. Currently these are Lt Col Paul D. MacGarvey and Maj Benjamin B. Williams. A military consultant and a staff assistant, both selected from officers assigned to OCRD, serve each subpanel.

The full Panel meets twice each year; subpanels meet as necessary. Few meetings are held in Washington because Panel members find it to their advantage to gather at various Army installations where they can make spot studies of current operations.

This year the Panel held its spring meeting at the U.S. Chemical Corps Proving Ground at Dugway, Utah, and its autumn meeting at Fort Knox, Ky., where the U.S. Army Armor Center School and Board, the U.S. Army Armor Human Research Unit, and Army Medical Research Labs took part.

Two subpanels went to California this autumn, the Environmental Research group to Fort Ord to be briefed on the activities of the Combat Development Center, and Human Factors

subpanel to the Presidio of Monterey to visit the Leadership Human Factors Unit. Members of the Chemical, Biological and Radiological subpanel met at the Army Chemical Center, Md.

The Panel was formed in 1951 by then Secretary of the Army, Frank Pace, Jr., as a small, informal group. In 1954 the ASAP became a permanent board consisting of 27 members. Since then it has been expanded to its present size, "to insure that the best possible advice could be obtained in this time of rapid technological changes and achievement."

Members of the ASAP stand among the leaders of their respective callings. As such, they are busy men whose time is valuable. Their willingness to attend meetings involving trips that take them far from their offices and laboratories has impressed the Secretary of the Army as evidencing their enthusiasm and devotion to national defense.

Because of the urgency and immediacy of their work, the logotype ASAP has, in this case, a double meaning: Army Scientific Advisory Panel and—As Soon As Possible.

ASAP Member Honored

Secretary of the Army Wilber M. Brucker awarded the Distinguished Civilian Service Medal to Mr. K. T. Keller, former Chrysler Corporation executive, for outstanding service on the ASAP. He is a member emeritus. The citation said, in part:

"Mr. T. K. Keller has contributed materially to the advancement of the Army Research and Development Program through his unique understanding of the Army, and the problems involved in the development of new material and weapons systems. Because of his exceptional advice and efforts, willingly and freely given to the Army, Mr. Keller has significantly increased our ability to defend the Nation. His outstanding service reflects great credit upon himself as a patriotic American citizen and industrialist."

Panel Members Listed

The present Chairman of the Panel is Dr. Clifford C. Furnas, chancellor of the University of Buffalo, Buffalo, N.Y. Dr. Furnas has served in many responsible positions, both in civilian life and government. Other members are:

Mr. K. T. Keller, former Vice President Chrysler Corp.; Dr. William H. Martin, Consultant, Stanford Research Institute; Dr. Harold C. Weber, Professor of Chemical Engineering, Massachusetts Institute of Technology; Dr. Ira L. Baldwin, Special Assistant to the President, University of Wisconsin; Dr. Stanhope Bayne-Jones, Department of Health, Education, and Welfare. Dr. Harwood S. Belding, Professor of Environmental Physiology, Graduate School of

Public Health, University of Pittsburgh; Dr. Hendrik W. Bode, Vice President Bell Telephone Laboratories, Inc.; Dr. Leonard Carmichael, Secy. Smithsonian Institution; Dr. C. S. Draper, Head, Dept. of Aero Engineering, Mass. Institute of Technology.

Dr. John R. Dunning, Dean, School of Engineering, Columbia University; Dr. William L. Everitt, Dean of Engineering, University of Illinois; Dr. Ralph E. Padum, Head, Dept. of Civil Engineering, North Carolina State College; Dr. Donald G. Fink, Director of Research, Philco Corp.; Dr. John S. Foster, Jr., Associate Director, University of California Radiation Lab.

Mr. Michael E. Gluhareff, Engineering Manager, Sikorsky Aircraft Division, United Aircraft Corp.; Dr. Lester M. Goldsmith, Consulting Engineer, Philadelphia, Pa.; Dr. Alvin C. Graves, Director Los Alamos Scientific Laboratory; Dr. Harry F. Harlow, Professor of Psychology, University of Wisconsin; Mr. Willis M. Hawkins, Asst. General Manager, Missiles and Space Division, Lockheed Aircraft Corp.

Dr. J. Herbert Hollomon, General Manager, General Engineering Laboratory, General Electric Co.; Mr. John G. Holmstrom, Vice President, Kenworth Motor Truck Division, Pacific Car and Foundry Co.; Dr. William A. Hunt, Professor of Psychology, Northwestern University; Dr. Charles C. Lauritsen, Professor of Physics, California Institute of Technology.

Dr. Andrew Longacre, Director, Defense Systems Laboratory, Syracuse University Research Corp.; Dr. Colin M. MacLeod, New York University School of Medicine; Dr. Ernest J. McCormick, Professor of Psychology, Purdue University; Dr. Frank C. McGrew, Director, Research & Development Div., Polychemicals Dept., E. I. du Pont de Nemours & Co., Inc.

Dr. Terris Moore, Environmental Research Consultant, Cambridge, Mass.; Maj Gen K. D. Nichols (U.S.A.-Ret.), Consulting Engineer, Washington, D.C.; Dr. A. A. Nikolsky, John C. Green Foundation, Princeton University; Dr. Daniel E. Noble, Executive Vice President, Motorola Inc.; Dean W. Albert Noyes, Jr., Professor of Chemistry, University of Rochester.

Dr. Walter J. Nungester, Chairman, Department of Bacteriology, University of Michigan Medical School; Dean Morrrough P. O'Brien, Dean Emeritus, College of Engineering, University of California; Dr. W. George Parks, Head, Department of Chemistry, University of Rhode Island; Dr. Joseph M. Pettitt, Dean, School of Engineering, Stanford University; Dr. William H. Pickering, Director, Jet Propulsion Lab., California Institute of Technology.

Mr. C. G. A. Rosen, Consultant Engineer, Woodside, Calif.; Dr. Roger W. Russell, Head, Department of Psychology, Indiana University; Dr. William Shockley, Director, Shockley Transistor, Unit of Cleveite Transistor, Mountain View, Calif.; Dr. Hector R. Skifter, President, Airborne Instruments Laboratory, Division of Cutler-Hammer, Inc., Long Island, N.Y.

Dr. Alfred H. Stanton, Psychiatrist in Chief, The McLean Hospital, Mass. General Hospital; Dr. Edward C. Stevenson, Associate Director, Research Laboratories for the Engineering Services, University of Virginia; Dr. C. O. Strother, Vice President, Union Carbide Nuclear Co., New York, N.Y.; Dr. Laurence C. Stuart, Professor of Zoology, University of Michigan.

Maj Gen L. G. Sverdrup (U.S.A.R.-Ret.), President, Sverdrup and Parcel, Inc., St. Louis, Mo.; Dr. William C. Tinus, Vice President, Bell Telephone Laboratories, Inc.; Dr. John E. Vance, Professor of Chemistry, New York University; Dr. William Van Royen, Head, Department of Geography, University of Maryland; Mr. Eugene L. Vidal, Aviation Consultant, Avon, Conn.; Dr. S. Rains Wallace, Jr., Director of Research, Life Insurance Agency Mgt. Assn., Hartford.

Dr. Ernst Weber, President, Polytechnic Institute of Brooklyn; Dr. Jerome B. Wiesner, Director, Research Laboratory of Electronics, Cambridge, Mass.; Dr. Frederick R. Wulsin, Professor Emeritus, Tufts University; Mr. James C. Zeder, Vice President (Ret.), Chrysler Corp.; Mr. Charles H. Zimmerman, NASA.

ORO Study Points to Team Research Trend

Notwithstanding the objection that group research in the fields of science and technology discourages individual incentive and creativity, modern scientific methods demand a shift from the "lone-wolf" scientist to the research team under able management.

This is the conclusion drawn in a technical paper published by The Johns Hopkins University Operations Research Office as part of a study made under Department of Army contract.

Inventions no longer come out of the sky on a kite string; they must be sought beyond ever-widening horizons, the paper notes. Nowadays even the lone-wolf scientist has to have elaborate laboratory equipment and assistance.

More than that, with the cost of equipment increasing in proportion to the intricacies of the instruments, no organization can afford to set up a laboratory unless it is to have a full complement of researchers. Finally, many of the machines utilized in experimentation have become so complicated that one or two scientists cannot handle them—the group has become a necessity, financially and operationally.

The authors of the paper, Mrs. Helen S. Milton and Mrs. Henrietta H. Green, denote that the trend toward group research is well on its way. They do this by citing the increase in the number of articles by two or more authors published in 10 scientific journals during the last 40 years.

In all, 69,020 articles were examined for authorship. The number of authors per article ranged from 1 to 20. Articles with two authors climbed from 33 percent of the total tabulated for 1920 to a high of 46 percent in 1935, then went down to 41 percent in 1959. Articles with triple authors showed the greatest gain with an increase from 7 to 18 percent. Multiple authorship went from 1 percent in 1920 to 10 percent in 1959.

The single author is being edged out by the team, but there are qualifications to be made on this assertion. Trends differ considerably among disciplines. Chemistry and physiology are fields in which the group approach has been the rule rather than the exception over a long span of years. The opposite is true of the mathematical field.

The real change has apparently come in the technical field. The *Review of Scientific Instruments* had only 21 articles with triple authors out of 370 articles for the early period, that is 5.7 percent, whereas for the past decade three and more authors accounted for 20 percent of the total.

As noted, the trend toward scientific teamwork indicated by the foregoing figures has opponents who argue that a

man may lose his identity in the group, that some of his research findings may not be published under his name, depriving him of professional recognition, and that, in an effort to conform, he may not assert his original ideas. Also, the tendency of all groups is to be conservative, which is not conducive to the birth of invention.

Scientists and businessmen have become aware of the disadvantages inherent in group research and are taking steps to overcome them. "The hazards of group research," the authors of the paper state, "appear to be chiefly psychological and organizational, and one of the best remedies offered is to have in every laboratory a capable and respected scientific administrator who can create an atmosphere of tolerant human

relations and can keep intercommunication flowing."

The authors mention the taxpayers' stake in progress in the fields of science and technology, noting that our Government is paying for over half the research and development currently in progress. They conclude:

"If the U.S. is not showing enough creativity the fault lies not wholly with our educational system or in the new phenomenon of group research. We are simply not yet attuned to group activity. Teamwork will not result of itself. It will only result through continued effort on the part of research management. If group research is a necessity today, then let us organize it for maximum production of ideas and their development."

Dr. Dobischek Presented Top Civilian Award

The nation's top honor for civilian employees, the Exceptional Civilian Service Award, was presented recently to Dr. Dietrich Dobischek by Army Secretary Wilber M. Brucker. The citation reads:

"For exceptional performance of duty as a chemist serving with the U.S. Army Signal Research and Development Laboratories, Fort Monmouth, N.J., between August 1949 and December 1959. His imagination and creative ability led to one of the major technological breakthroughs in the 30-year history of vacuum tube design. His contribution shows promise of exerting

a major impact on present-day electronics, greatly adding to the effectiveness of military equipment, and bringing about a substantial saving in procurement costs, applicable to all Armed Services. His achievement not only reflects great credit upon himself and the U.S. Army, but provides great inspiration and incentive to his fellow workers."

Employed by the Signal R&D laboratories since 1949, Dr. Dobischek, 54, is assigned as consultant on photocapacitors, thermionic converters, electroluminescent devices, ultrahigh vacuum gettering devices and cold cathode tubes.



Secretary of the Army Brucker (right) presents Exceptional Civilian Service Award to Dr. Dobischek as Signal Chief Maj Gen R. T. Nelson looks on.

HFE Meet Seeks More United R&D Effort

Broadened participation of the general scientific community in meeting Army research and development requirements in the critical area of man-machine compatibility was stressed among primary purposes of the 4-day Sixth Annual Army Human Factors Engineering Conference.

Under the auspices of the Chief of Research and Development, Lt Gen Arthur G. Trudeau, some 250 scientists and engineers attended the Oct. 3-6 sessions at the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Invited to take part for the first time since the conference was initiated, fully a third of the attendees represented non-Government agencies, industry, universities and numerous nonprofit R&D activities. New to the conference also were representatives of the Army Participation Group at the Naval Training Device Center (NTDC), The Adjutant General's Personnel Research Branch (PRB), and the Human Resources Research Office (HumRRO) at George Washington University.

Keynote speaker Richard S. Morse, Director of Research and Development, Department of the Army, discussed the theme of the conference, "Army, Industry, and the Soldier." Expressing his gratification over the large representation from many of the nation's leading industrial firms and other R&D activities outside the Army, he said:

"... As General Trudeau indicated last year, it is appropriate and necessary that all aspects of the Army's human factors R&D effort combine with the Technical Services and the Nation's university and industrial talents in coordinated teamwork for man-machine compatibility ... to bring the best research to rapid development and operational use for the maximum effectiveness of the soldier..."

Commenting on the rapid acceleration of Soviet science in all the major disciplines, Mr. Morse said the United States is fighting for survival and that "our human factors program must apply a developing technology of human behavior to assist the soldier to move, shoot and communicate more effectively in any type of warfare against any potential enemy."

The Free World, Mr. Morse said, "has the capability of stronger and more rapid development of science and technology for (1) measurement of human individual differences; (2) management of man's ability for self-modification through learning, training and education; (3) objective prediction of human purposive performance, and (4)

matching of human and machine compatibilities for maximum effectiveness and productivity."

Maj. Gen. Louis T. Heath, Deputy Chief of Staff for Materiel Development, U.S. Continental Army Command, spoke on the subject of "Soldier First." Timely, careful and sound application of human factors engineering principles to all phases of development of materiel and equipment, he said, is essential in the light of scientific advances.

Dr. Charles W. Bray, II, Special Research Director of the Research Group in Psychology and Social Sciences,

Smithsonian Institution, discussed "A Program of Research on the Technology of Human Behavior."

Dr. Lynn E. Baker, Chief Psychologist, Office of the Chief of Research and Development, Department of the Army, was the conference chairman. Maj. Gen. Stephen R. Hanmer, Deputy Chief of Engineers for Military Operations, and Col. John E. Walker, Acting Director of the U.S. Army Engineer Research and Development Laboratories, made welcoming remarks. Conference host was Lt. Gen. E. C. Itschner, Chief of Engineers.

Skin Talk, Night Vision Tubes, TV Control Of Tanks Discussed in Papers at HFE Meet

Scientific papers presented at the Sixth Annual Human Factors Engineering Conference which made newspaper headlines included research reports on a technique of silent communication by skin shock, a new family of night vision electronic tubes, closed circuit television for possible future control of tanks in combat, and a potent chemical incapacitating agent.

Experiments supporting the feasibility of using low voltage electric current to transmit messages interpretable through vibratory sensations of the skin formed the basis of a paper presented by Capt. Glenn R. Hawks, research psychologist at the Army Medical Center, Fort Knox, Ky. Mild shocks triggered by radio might be used by sentries in enemy territory for silent communication at four distinct intensity levels, he said, varying from a tingling sensation to pain resembling a pin prick.

Other possible applications of the skin communication technique to modern military needs, as suggested by Capt. Hawks, include warning devices to alert the pilot to malfunctioning of equipment in aircraft, a supplemental sense for the blind or the deaf, and communication in high-noise areas.

Development of new electronic vision tubes by the Corps of Engineers was reported by Mr. John Johnson of USAERDL and Dr. M. L. E. Chwalow of Frankford Arsenal. Progress recently in intensification and storage of images has made it possible to extend the threshold of vision during darkness to light levels 1,000 times below the threshold of the ordinary unaided eye.

Noiseless electronic vision tubes with light amplification gains of 50,000 to 1,000,000 are used in achieving the latest research results. Light levels for such devices are provided by star-

light and night sky glow generated by atmospheric molecular recombinations.

Studies have established the fundamental light limitation level for such night vision devices at an order of magnitude below the currently accepted limit. Further, a vision transformation method for image analysis considerably simplifies the calculation of the decision making properties of electro-human vision systems. Matching and synthesis of such devices is believed to have numerous military applications.

Findings on "Closed Circuit TV Driving Studies," as reported by 1st Lt. Gene L. Brown, U.S. Army Ordnance Human Engineering Laboratories, Aberdeen Proving Ground, Md., hold good promise for the future control of tanks in combat. Results with an Army "Mule" all-purpose vehicle showed the feasibility of such control, he said, but also pointed to the need of continued research. When perfected, the system will permit tanks to operate "buttoned up," thus protecting crewmen in combat.

Dr. Earl Davy, Chief, Psychology and Human Engineering Branch, U.S. Army Chemical Center, Edgewood, Md., told of an unnamed chemical which will open the way to conquest of a city without destruction or bloodshed. Inhabitants, he said, would be temporarily incapacitated—unable to resist an invading force—but would suffer no ill effects and could be profitably employed by their conquerors.

Complete reports of conference proceedings will include the papers herein mentioned and 13 other papers. Each attendee will receive the report. Other individuals or agencies may obtain the report, within limitations of supply, by writing to the Human Factors Division, Army Research Office, OCRD, Department of the Army, Washington 25, D.C.

700 at Symposium Attest to Bionics Interest

Bionics, a relatively new scientific term, is defined as the art of applying biological systems to engineering systems. Potentially of great significance to Army requirements, bionics depends upon close teamwork of biologists, mathematicians and engineers to produce effective results.

Reflecting the tremendous increase of interest and expansion of research in this field, the first major symposium ever held on bionics attracted about 700 persons from Department of Defense agencies, industry, universities and non-profit research organizations to Dayton, Ohio, Sept. 13-15. Wright Air Development Division (WAAD), U.S. Air Force, sponsored the meeting.

One speaker said attendees "were probably present in spite of their formal education and past experiences, rather than because of them." Far from being facetious, the statement was a frank recognition that the future training of qualified personnel for research and development in bionics is a task of great magnitude.

The ultimate aim of bionics is a machine, a "living prototype," which can make intelligent decisions, learn on its own, and adapt to its environment. As stated during the symposium, the problem is "how can one build a machine that can do what a 1-year-old child can do in the future course of events." Bionics research is in its infancy as to discovering the means whereby the complex patterns of the nervous system can be solved.

Notables at the symposium included Dr. H. E. Savely, Air Force Office of Scientific Research, Air Research and Development Command (ARDC); Dr. Warren S. McCulloch, Massachusetts Institute of Technology; Prof. H. von Foerster, University of Illinois; Mr. L. A. deRosa, International Telephone and Telegraph Company; Dr. David O. Ellis, Litton Industries; and Lt Gen B. A. Schriever, Commander, ARDC.

Dr. D. McK. Rioch, Technical Director of Research, Walter Reed Army Institute of Research, and Capt H. H. Pattillo, Life Sciences Division, Army Research Office (ARO), took part in the symposium. In his report to Lt Gen Arthur G. Trudeau, Chief of Research and Development, and Brig Gen William J. Ely, Director of Army Research, Capt Pattillo stated, in part:

"... Even though computers have made major contributions to our present explosion in scientific knowledge, most of them are capable only of high speed arithmetic. However, since we have built math computers which are faster and more reliable than man, then it appears possible to produce bio-



Dr. Arthur Rudolph is Director of the new R&D Division, Army Ballistic Missile Agency, Redstone Arsenal.

computers with superhuman capabilities.

"The key lies in discovering more about the living world and applying it to machines, and unraveling the successes in nature to improve our machine systems.

"Examples of such successes in nature are use of an infrared sensing device by rattlesnakes; ability of some fish to detect changes of 2×10^{-5} micro-amperes/mm; chemical receptors by which male moths home-in on female moths; radar used by bats and porpoises; navigation of birds; and use by some insects of the night sky and stellar patterns for navigation. Although we have some knowledge of each, much remains to be learned.

"Often the payoff in such research is completely unexpected. As an example, a scientist at the Max Planck Institute was studying the behavior of beetles to a changing light pattern. It was discovered that the beetle could detect acceleration changes due to the color change of a background pattern. The principles were applied to the design of a ground speed indicator now in use by the Air Force.

"Imitation of nature's systems, however, has many pitfalls, and duplication of nature may not be either practical or economical. If men had started out and exhaustively pursued the study of bird feathers, we would still not be flying.

"A biological model cannot start from the engineering end of the spectrum. Fundamental knowledge of the brain and nervous system is essential. There is no mathematics that can describe a neuron, which is a nerve cell that is a

structural unit of the nervous system. A neuron was described by Dr. McCulloch as an 8th order nonlinear differential equation.

"When you recognize the millions of neurons which make up the nervous system, then the complexity of constructing a mathematical model is 'somewhat difficult.' However, when enough is learned about individual components, then a reliable system made up of unreliable components is capable of achievement.

"Computers have been built which can play chess, checkers, recognize 12 spoken sounds, compose chords and musical melody, and serve as an 'efficiency expert' for a washing machine assembly line. However, each of these is restricted to the one specific task—it concentrates on certain inputs and ignores others. Only when flexibility is achieved can it be said that living systems have been mechanized.

"Microminiaturization and Medical Electronics will play an important part in the development of learning machines. As an example, in the human auditory system, the cochlea contains 30,000 nerve receivers. RCA Research Laboratories have built a model which represents $\frac{1}{64}$ inch of the auditory system—and it is 18 feet long.

"Results of bionics research will have applications in both military and civilian pursuits. Examples are data processing, satellite and missile reliability, space probes, man-machine coupling, hearing, prosthetic devices, and possible cure of cancer. . . ."

To emphasize the potential impact of bionics as an expanding field of research, Capt Pattillo referred to a statement made by Dr. Savely at the Air Force symposium. Dr. Savely said he believes the solutions of the fundamental problems of life have more significance for the advancement of mankind than any other type of research.

Chemical Corps Contracts For Germ Warning System

U.S. Army Chemical Corps studies at Fort Detrick, Md., resulted in the recent award of a \$661,000 contract to the Douglas Aircraft Company for design and testing of an automatic warning system to alert the nation against germ-warfare attack.

Prototype equipment produced by the Chemical Corps has indicated the feasibility of a system that will "smell out" deadly germs in the atmosphere and flash instant warning to military and civilian health authorities.

Similar in concept to existing air-attack warning complexes, the biological warfare system will employ sensitive devices linked to computers that will record data for immediate relay to information centers equipped to initiate countermeasures against surprise attack.

In addition to the overall U.S. warning system, the Army expects to develop a mobile version to protect its troops overseas.



Distinguished woman scientist, Mrs. Frances L. Whedon, ARO staff meteorologist, receives 20-year Federal Service Certificate from Brig. Gen. William J. Ely, Director of Army Research. She has served the Army for over 18 years.

Mrs. Whedon Exemplifies Important Role Women May Achieve in Defense Research

Few women in science in the Department of Defense have gained more widespread confidence and respect for professional competence and dedication to research tasks than Mrs. Frances L. Whedon, who recently was awarded a 20-year Federal Civil Service certificate.

Staff meteorologist for the Army Research Office since August 1959, Mrs. Whedon is a graduate from Massachusetts Institute of Technology. She obtained an S.B. degree in physics at a time when the ratio of 25 coeds to 2,500 male students at MIT indicated their pioneering role in the field of science and engineering.

Eighteen years of meteorological work in the Office of the Chief Signal Officer, Department of the Army, helped to qualify Mrs. Whedon for the exacting requirements of her present duties. During her OSigO service Mrs. Whedon gained recognition through appointment as Army representative on various Inter-Service working groups in the relatively new area of the upper atmosphere sciences.

Meteorological studies in the upper atmosphere of the Arctic and the Antarctic constituted one of the Army's major efforts during the recent International Geophysical Year. As a member of the Joint Coordinating Committee, she had the responsibility of coordinating all Signal Corps activities

related to the IGY program, and also was the Army representative on the Meteorological Committee sponsored by the National Science Foundation.

One of the most significant phases of Army participation in the IGY was the program of rocket and balloon explorations of the upper atmosphere, as related to military communications, missiles and weather forecasting requirements. Mrs. Whedon played a prominent part in formulating plans for the rocketry investigations pursued in firings at Fort Churchill, Canada, White Sands, N.M., and other ranges.

On High Altitude Balloon Team

More recently Mrs. Whedon was the Army representative on the High Altitude Balloon Team composed of meteorologists from the Armed Forces and representatives from the Federal Aviation Agency (FAA). The team surveyed activities concerned with release of high altitude balloons, with approval by CAA (FAA) Centers, and with communications facilities for tracking the balloons. As a result, the joint Department of Defense regulation pertinent to these activities was rewritten.

Another important aspect of Mrs. Whedon's recent work (1958-59) was the planning of a program, still in progress, for atmospheric investigations above 100,000 feet, using small rockets

ARO Reviews Research On Machine Translating

Approaches being explored by various research groups working on an urgent problem of the Department of Defense—machine translation of scientific reports—are reviewed in the draft version of a report the Army Research Office is preparing for publication.

The foreword states: "This report was written to furnish a review and analysis of machine translation research sponsored by the Department of the Army specifically and by all Government agencies in general. It summarizes the history, objectives, present status, and projected plans for machine translation research. . . ."

"Machine translation," author Lt Col Dimitri A. Kellogg states, "consists of inserting text material in one language into a computer containing a translation program and a dictionary, and obtaining as a product an acceptable version in another language."

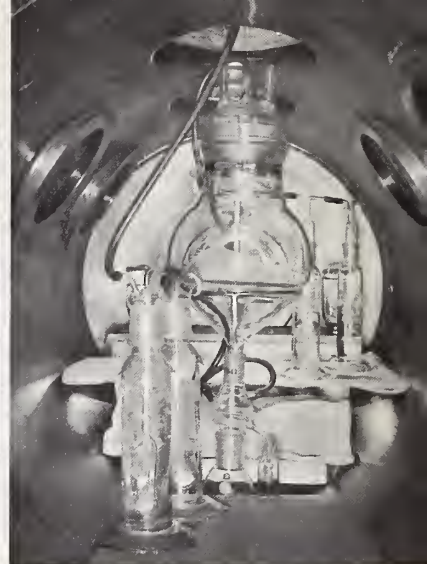
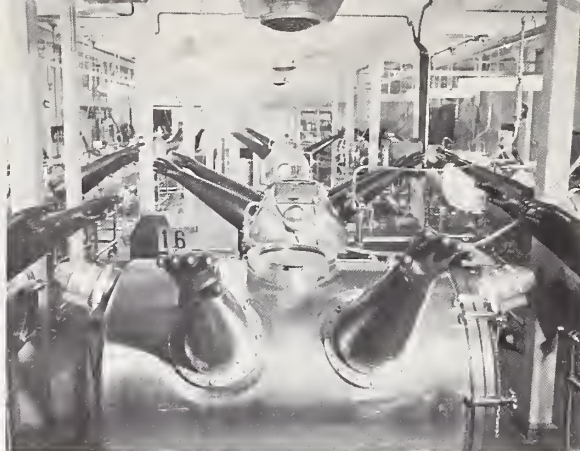
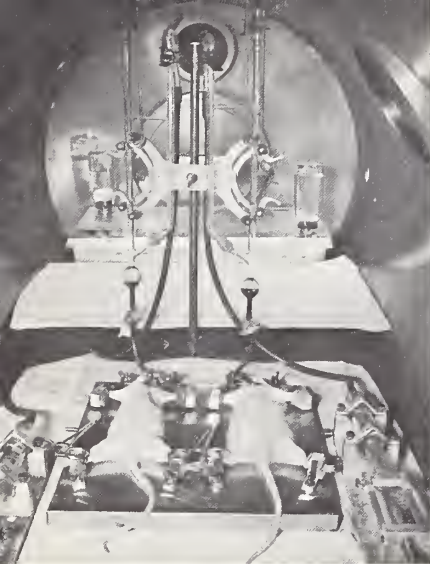
Research in machine translation systems, the author notes, currently is being sponsored in the United States primarily by Government agencies at an annual expenditure rate of over \$2,400,000. The Air Force has the largest program, \$1,400,000, followed by the National Science Foundation, \$460,000, the Army, \$225,000, and the Navy, \$150,000.

capable of reaching altitudes of 200,000 to 250,000 feet. The joint network of seven firing ranges is sponsored jointly by the Army, Navy, Air Force, and the National Aeronautics and Space Administration.

For several years, beginning in 1950, Mrs. Whedon monitored "Project Cirrus," a joint Army Signal Corps-Navy effort carried on with Air Force planes under a contract with General Electric Co. The object of this study, during which Mrs. Whedon worked with the late Dr. Irving Langmuir and Dr. Vince Schaefer, was to find ways of clearing clouds which might be used in tactical military operations.

Queried about present opportunities for women scientists and engineers in Government R&D activities, she said:

"In my opinion, opportunities exist for women as well as for men. Army leaders are cognizant of the increasing role women can fill in meeting the Nation's needs through scientific research. Recruitment of top graduates from our colleges and universities in the science and engineering fields is being carried on, I believe, with little regard for the outdated theory that women cannot compete with men in this area. Women scientists have demonstrated they can be equally competent, if well trained, when given equal opportunities."



Sterile inside, these gloves await insertion of scientists' hands which will enter tank to manipulate mice and equipment in germfree research carried out in the only known military laboratory of its kind in the world, located in Washington, D.C.

WRAIR Germfree Research Opens Vistas

(NOTE: The potential impact of germfree animal studies upon military medical progress, as recognized by the Chief of Research and Development, Department of the Army, warrants more space than can be devoted to this subject in a single issue. The Newsmagazine will continue the following article in January.)

Notable achievements of a modest program in a relatively short time have focused mounting interest on the "great promise" of expanded effort in germfree animal studies conducted at the Walter Reed Army Institute of Research (WRAIR), Bethesda, Md.

The Department of Germfree Research was organized at WRAIR in 1955 and is believed to be the only military laboratory of its kind in the world. Importance of this research has been recognized by top Army leaders, and is explained in the Department's statement of mission as follows:

"Investigation of fundamental problems of paramount importance to military medicine which cannot be solved with conventional animals and conventional laboratory and clinical techniques."

In the words of a Department of Germfree Research official:

"Microorganisms of man and ordinary laboratory animals are a major complicating factor in studies of basic importance to improved medical care. These microorganisms are invariably present, and cannot be controlled adequately enough for experimentation.

"For example, it is impossible at present to separate clearly those meta-

bolic and physiologic effects due to trauma, *per se*, from those due to complicating 'infections' or toxemia, overt or masked. Yet these factors can be readily determined by systematic studies with germfree animals and animals purposely exposed to one or a great number of known microorganisms.

"The techniques of the Germfree Laboratory allow the scientist not only to rear and maintain animals free of microorganisms, but also to maintain rigid control over microbial flora which he may introduce at will, and which may be a single species or multiple species, in order to determine precisely the role microorganisms exert in specific situations.

"Properly designed experiments with germfree animals and animals with known microflora can yield solutions to problems that cannot be solved with conventional animals, or that can be answered at best with equivocal inferences, and after much tedious effort.

"There is a growing realization that what we are, and how we respond to various stresses and stimuli, are conditioned to a large degree by our present and past microbiologic and immunologic experiences.

"This idea is not new. Almost as soon as bacteria were discovered, the question was raised as to the physiologic and clinical significance of the varied microflora present in all of us during health. This question regarded the effects of microorganisms quite apart from those influences largely attributable to overt clinical infections.

"Metchnikoff was of the opinion that the large numbers of varied bacteria normally present in the gut were harmful. He suggested a procedure which would have made surgeons a very busy group, namely, colectomy! Understandably, this view has never been very popular. As an alternative measure, he advocated drinking yogurt—to reestablish a type of flora which might simulate that in the breast-fed infant.

"Pasteur, on the other hand, had felt that since the bacteria were normally present, they were almost certainly serving a useful purpose. He held the view that animal life without microorganisms would not be possible. But he realized that his preconceived view might not be correct and suggested in 1895 that the hypothesis be put to test. . . ."

During the period 1896-1910 researchers had varying degrees of success in rearing bacteria-free animals, such as a guinea pig, a goat and chicks, but were plagued by problems of designing equipment to prevent contamination of sterile animals and by a lack of knowledge of animal nutrition.

World War II retarded germfree animal studies, but in the 1930's Glimstedt in Sweden maintained bacteria-free guinea pigs for almost a year. Reyniers and his colleagues, working at the University of Notre Dame's Lobund Institute, raised a germfree monkey, mice, chickens, rabbits and rats, and also succeeded in breeding germfree rats and mice, from 1928 through 1946. Gustafsson has extended Glimstedt's work in Lund, Sweden, since the middle 1940's. Miyakawa and his

colleagues started a germfree laboratory at Nagoya, Japan, in the middle 1940's.

The basic principle upon which the production, rearing and utilization of germfree animals depend is the maintenance of a mechanical barrier between the germfree internal environment and the contaminated external environment, together with reliable procedures for the transfer into sterile tanks of animals and experimental materials, sterilization of diet and production of properly conditioned sterile air. Chickens are hatched from eggs whose shells have been sterilized before entry into the sterile tanks. Mammals may be delivered by Cesarean section inside a special germfree operating unit or may be produced by germfree parents. Germfree rats and mice have been maintained through several generations at the Germfree Laboratory at WRAIR.

The germfree animal resembles its conventional counterpart in many respects. Early development and growth are qualitatively similar. Detailed body biochemical, physiological and compositional studies have not yet been accomplished. The most striking morphologic differences are that the cecum is larger and lymphatic organs are generally smaller in germfree animals.

The intensive study of the physiologic and metabolic effects of injury, be it caused by blast, heat, cold, ionizing radiation or combinations of these agents, is of basic importance to military medicine.

As stated by a WRAIR official: "In every war, shock has been the major emergency complication of the wounded soldier, and this problem will be even greater in any future war. Considerable delay in the treatment of civilian and military casualties caused by thermonuclear warfare must be anticipated. 'Irreversible' shock will become a clinical problem of a magnitude never before encountered. (Irreversibility is a state of refractoriness to treatment in which the best available treatment fails to prevent or only delays circulatory failure and death.)

"The specific physiologic and metabolic disturbances which determine 'irreversibility' to shock are unknown despite innumerable studies with conventional animals over the last 45 years. Impressive circumstantial evidence has accumulated which suggests that while lessened blood volume is the primary cause of shock, the development of irreversibility after severe hemorrhagic or traumatic shock is due to the entry of bacterial endotoxins into the circulation.

"If this hypothesis is correct, it would seem that the germfree animal should

QM R&E Center Encourages Young Scientists

Promising young scientists in Natick, Mass. (population 20,000), are profiting by an example of Army R&D community relations that offers instruction not otherwise readily available to them.

Personnel of the Quartermaster Research and Engineering Center Laboratories, QM Research and Engineering Command, Natick, in cooperation with the Science Department of the Natick High School, are conducting science seminars to provide guidance for work more advanced than is offered in the regular high school curriculum.

As many as six science students are selected annually on the basis of their interest and scholarship in science. Each is assigned to a scientist at the QM R&E Center. The scientist and the student together work out a program of reading and investigation on a topic of interest to the student.

During the summer vacation, the student does background reference reading, with access to the Technical Library at the QM R&E Center. When school resumes the students and their advisors meet in seminars with Seminar Director Dr. Otto A. Bessey, Associate Chief of the Environmental Protection Research Division of the QM R&E Cen-

ter Laboratories. The students discuss mutual problems and report on the progress of their individual projects.

At a final seminar, the students present results of their investigations before an invited group that includes teachers and advisors. The 1960-61 group, composed of three girls and three boys, has special interests in solar radiation, physiology, biochemistry, and microbiology.

As an outgrowth of the program, Harvey Davis, a June 1960 graduate of the Natick High School, is attending Northeastern University with the assistance of an annual scholarship awarded by the research directors of the QM R&E Center. Dr. Dale H. Sieling, Scientific Director of the QM R&E Command, presented the award to Davis, a student trainee at the QM R&E Center during the summer of 1960.

After finishing his freshman year at Northeastern, where he is studying electrical engineering, Harvey will attend college classes for 10 weeks, then work at the QM R&E Center for 10 weeks, in alternating periods. This is a cooperative program which has been in effect for several years between the University and the QM R&E Center.

be more resistant to shock than conventional bacteria-laden animals. Studies of hemorrhagic shock of rats and tourniquet shock of chicks undertaken at the WRAIR Germfree Laboratory have shown that this hypothesis is not correct. In the rat experiments no differences were noted in the hemodynamic response, survival, or autopsy findings of the germfree and conventional animals. Germfree chickens actually showed an increased susceptibility to tourniquet shock.

"The possibility was considered that the small amount of endotoxin presumably present in the autoclaved diets now used for the germfree animals, and therefore present within their intestine, may be functionally equivalent to the much larger amount of endotoxin present in the conventional animal. This would result from the presumed impairment of reticulo-endothelial function in the germfree animals. However, this supposition was incorrect inasmuch as no difference in response to injected endotoxin by germfree and conventional mice has been observed.

"It is therefore clear that lethal shock can be induced in the absence of viable bacteria, and that the course of events following the shock procedure, as judged by the hemodynamic and pathologic changes, is similar whether viable bacteria are present in the animals or not.

"The threat of radiation injury from fission or fusion bomb explosions and fallout, with their tremendous killing potential, demands accelerated efforts to find effective radioprotective and therapeutic methods. The search for such methods is hampered by insufficient knowledge of the fundamental causes of cellular injury induced by ionizing radiations. Irradiation studies with conventional animals are complicated by the presence of various microorganisms. The biologic changes, behavior of the animals, their morbidity and death are all affected by their microflora.

"Work at the Germfree Laboratory at WRAIR has shown that *germfree mice and chicks are strikingly resistant to whole body X-irradiation*. This is so not only for doses of irradiation which result in death during the period of one to three weeks after exposure when conventional animals may die of overt infections, but after doses of irradiation which result in very early deaths.

"Up to now, it had not been thought that microbes played important roles in these early fatalities. The germfree animal is proving to be a powerful tool for unraveling the complex mechanisms of acute and delayed radiation-death and for defining the precise role of microorganisms in the radiation syndrome."

(To be concluded next month)

Trail Blazed by Renowned Explorer Leads Danish, U.S. Scouts to Arctic Adventure



Two 17-year-old Boy Scouts, Kent Goering, of Neodesha, Kans., (left) and Soren Gregersen, of Korsor, Denmark, chat with Dr. Paul A. Siple, Scientific Advisor to the Director of Army Research, before starting a 7-month duty tour at Camp Century, Greenland. Dr. Siple went to Antarctic with Admiral Byrd.

Thirty-two years ago a 20-year old Boy Scout was selected from many eager applicants throughout the United States to accompany Admiral Byrd's first Antarctic expedition (1928-30) as dog driver, biologist and naturalist. Famed now in many lands for his subsequent polar exploits, that former Scout has helped to start two Scouts, one Danish, the other American, along a similar trail of high adventure and opportunity for careers in science.

Dr. Paul A. Siple, Scientific Advisor to the Director of Army Research, Brig. Gen. William J. Ely, furthered, with others, the idea of selecting two Scouts who started off in mid-October for service as junior scientific aides in the Army's widely publicized "under ice and snow city," known as Camp Century, Greenland.

Selected from thousands of candidates in their respective countries, Kent Goering, 17, of Neodesha, Kans., and Soren Gregersen, also 17, of Korsor, Denmark, will remain at Camp Century until April 1961. Under the supervision of Camp Century Commander Capt.

William Cahill, Corps of Engineers, they will study geological, glaciological, engineering, meteorological and polar medical problems. They also will share in routine tasks of camp maintenance.

All expenses of the Scouts, including transportation to and from their homes, will be paid by the Corps of Engineers, but they will draw no salary. The value of their experience in shaping their future careers is considered far in excess of any salary that might reasonably be paid.

Maj. Gen. S. R. Hanmer, then Acting Chief of Engineers, and Dr. Siple sat in with a panel of National Boy Scouts of America (BSA) officials that selected the U.S. representative. Criteria included scouting proficiency, enthusiasm, character and scholarship. Goering, holder of 68 merit badges in scouting, is enrolled for the 1961-62 term at the University of Kansas. He leans toward mathematics and chemistry but has not yet selected his major field.

Gregersen was selected by the Danish Boy Scout organization. A graduate of Korsor Akademi, he plans a nuclear

physics career but his university enrollment must wait until he completes a requirement for two years of military training.

Upon arriving in Washington, D.C., Oct. 14, the two Scouts were feted by General Hanmer, BSA officials—including Dr. Siple of the National Council—and Danish Embassy representatives at the Army's nearby Engineer Center, Fort Belvoir, Va. They toured the Engineer Research and Development Laboratories, saw the Army's original atomic reactor and were shown the Capital City's points of interest before taking off on Oct. 16 for their 7-month Arctic adventure.

Although located in an area potentially of strategic importance, Camp Century, of itself, is termed "nonmilitary in tactical concept." Instead, it is an outpost of environmental research directed toward increasing world knowledge regarding a polar frontier of widespread scientific interest. Selection of two Scouts representative of countries cooperating in research is intended to symbolize peaceful aspirations pertaining to the area.

"I think that civilian scientific organizations as well as defense forces should set up similar opportunities for selected youths," Dr. Siple said. "Our bright youngsters intent on careers in science need to get their feet wet in practical scientific work before they finish their schooling—as I did with the Byrd expedition. It is vital to the Nation's future that young people's interest in science be stimulated through real field work of this kind."

Thorlin Fills MASA Post

"Two hat" status has been directed for Brig. Gen. John F. Thorlin, Commanding General of the Ordnance Tank-Automotive Command (OTAC), by Secretary of the Army Wilber M. Brucker.

The dual responsibility resulted from Gen. Thorlin's appointment as Executive Director of the newly formed Military Automotive Supply Agency (MASA), which will procure and distribute all military automotive material and equipment to the Army, Navy, Marine Corps and Air Force.

MASA was organized earlier this year after the Secretary of Defense designated the Secretary of the Army as Single Manager for all Military Automotive Supplies. Both OTAC and MASA are located in Detroit, Mich.

Tech Services Seek Transfer of S&E Officers

Vacancies within the Army Technical Services are waiting for officers qualified in certain scientific, professional or technical fields and the Army is encouraging eligible individuals to seek branch transfers to fill them. Educational and professional qualifications by grade and branch are included in the recently published DA Circular 614-8.

The Chemical Corps is seeking majors, captains and first lieutenants with degrees in physics, nuclear physics or nuclear effects engineering. However, individuals in these grades with at least two years of college in a physical or natural science, mathematics, chemical, mechanical or industrial engineering, business administration or industrial management may also qualify.

The Corps of Engineers seeks captains and first lieutenants with B.S. degrees in some field of engineering or physical sciences coupled with practical experience. Certain individuals with two years of college background in the engineering or physical sciences may also apply for transfer in these grades.

Captains and first lieutenant sanitary engineers are sought by the Medical Service Corps (MSC). Minimum requirement is a B.S. degree in sanitary, civil or chemical engineering. Officers with training at the master's degree level in sanitary engineering, public health, industrial hygiene, radiological hygiene, physics or environmental health are particularly needed. The circular states that only persons so qualified will be considered in captain grade. MSC also needs pharmacists with B.S. degrees awarded by an institution accredited by American Asso-

ciation of College of Pharmacy, who are licensed to practice in a State or the District of Columbia.

Ordnance Corps vacancies in grades first lieutenant through lieutenant colonel require officers with bachelor degrees or higher, or at least two years of military or civilian experience in engineering sciences. Particularly desirable fields of education or training are aeronautical, automotive, chemical, electrical, electronic, industrial, mechanical, metallurgical and nuclear effects engineering. Others include industrial or production management, business administration, mathematics and statistics and physical sciences, especially chemistry, physics or nuclear physics.

Captains and first lieutenants are sought by the Quartermaster Corps. Desirable is a degree in business administration, industrial management, food technology, petroleum engineering, textile engineering, mathematics or physics. Previous combat arms duty as platoon leader or company commander is also desirable.

Officers in grades captain through lieutenant colonel with bachelor or higher degrees in engineering, the physical sciences, business administration, education, photography and television, journalism, meteorology, industrial management or economics may apply for Signal Corps vacancies.

Openings exist in the Transportation Corps for captains and first lieutenants with bachelor or master degrees in aeronautical or mechanical engineering. TC is particularly interested in those also qualified as Army aviators.

Army Basic Research Grants Program Expanding

Objectives of the basic research grants program inaugurated by the Office of the Chief of Research and Development, Department of the Army, under provisions of Public Law 85-934, are being accomplished at an accelerated pace.

Universities, colleges and other non-profit institutions report the grants program is "one of the greatest advances by the military services in the support of basic research in many years." Participation in the program is advancing in line with the Army aim of exploiting the full potential of the civilian scientific community in pursuance of discoveries geared to military requirements.

Grants coordinated through the Army Research Office by the Technical Services, to whom most of the research proposals are submitted for initial analysis

and approval, totaled approximately 200 as the *News* magazine went to press. The largest grant was \$152,000, awarded by the U.S. Army Medical Service to the University of Notre Dame for research extending over a 3-year period.

Principal advantages of the grants system, as opposed to the contracts system which it is gradually replacing for support of basic research in the Army, are listed as: (1) more freedom of action for the chief investigator, (2) absence of complex accounting for funds, (3) reduction of the rigid reporting requirements inherent in contracts, (4) elimination of the requirement for rigid accounting for equipment, (5) ease in disposing of equipment by vesting title in the research institution or organization, (6) reduction in overhead costs, and (7) flexibility in reaching agreement relative to awards.

Army Regulation 70-5, dated Dec. 28, 1959, and titled "Grants to Nonprofit

Desert Tests Indicate Man Needs More Food In Heat Than in Cold

Experiments at the Army's torrid Yuma Test Station in Arizona tend to disprove a long-held theory that a man should eat less food in extremely hot weather than in cold.

Findings have resulted in a recommendation by researchers at the U.S. Army Medical Research and Nutrition Laboratory that the dietary allowances under varying weather conditions, as determined by the National Research Council and by the Food and Agriculture Organization of the United Nations, be reevaluated.

Test results are reported in a paper prepared for the recent Fifth International Congress on Nutrition held in Washington, D.C. Authors are C. Frank Consolazio, Chief of the Bioenergetics Division, USAMRNL, Fitzsimons General Hospital, Denver, Colo., Ralph Shapiro, John F. Master-son and Philip S. McKinzie.

Divided into 10-day periods, experiments were conducted first in the hot sun at 105 degrees F., then in the hot shade at 104 degrees, and finally in an air-conditioned room at 78 degrees. Eight healthy men were kept on a regulated daily physical activity program and allowed to eat all the food they wanted at meal times. Water was available at any time desired.

Combined food "intakes" (food eaten and body tissue "burned") represented an increase of 1,320 calories per day for the hot periods over the cool periods. Fluid and nitrogen balance and body composition proved that the weight increases were due to an increase of water in the body which even exceeded the weight gain.

Researchers reported the test subjects actually lost body tissue during the hot periods, presumably metabolizing it to supplement the already increased food consumption in satisfying the body's energy requirement.

Organizations for Support of Basic Scientific Research," implemented the Army program. The regulation is based on implementing instructions developed by a committee composed of representatives of the Army, Navy, Air Force and Department of Defense Research and Engineering. Further implementing information is contained in an Army Research Office brochure titled "Scientific Research Grants," distributed to more than 350 colleges and universities early this year.



Army's communication satellite COURIER, capable of receiving and transmitting 1,400 words per second, was sent into orbit Oct. 4 and gained worldwide attention by transmitting a message from President Eisenhower to the United Nations. Power is generated by 19,000 solar cells on satellite's surface.

The Army's New Role in Space Communications

By Maj P. W. Powers

Missiles & Space Division, OCRD

Since the time of the Civil War and the wigwag flags and torches Maj Albert J. Meyer, the surgeon turned communicator, the Army has pioneered new methods of communications. Today the use of the telephone, teletype, TV, radar—all serve to contribute to the command and control of our forces deployed on a global scale. In addition, these means of communication—and the products of research and development to achieve them—almost always have benefited the civilian economy.

Communication by satellite should be no exception. Although many will groan over the possibility of our TV cowboys invading the under-developed areas of the world, the feasibility of such systems as international mail sent by facsimile transmission may be a brighter note. Here is the possibility of "space mail" automatically sent to and received at any corner of the globe in reasonable time, perhaps, of one day.

The Army assumed a major role in the military space communications area on Sept. 15 of this year when the Department of Defense assigned to it responsibility for development of two communication satellite systems. These systems are COURIER and ADVENT. The COURIER satellite achieved national acclaim when it began its successful orbit on Oct. 4 and subsequently underwent dramatic communications tests initiated by the President's message to the United Nations via space.

ADVENT is a 24-hour satellite system that involves a complex scheme of launching, injection into orbit, maintaining a precise synchronous orbit, and then communicating with ground and shipboard stations.

A management agency operating directly under the Chief Signal Officer has been established at Fort Monmouth, N.J., to carry out the Army's responsibility in this program. Also involved are the Ballistic Missile Division of the Air Force for the launching vehicles and the satellite, the Army Signal R&D Laboratory for the communications, the National Aeronautics and Space Administration for the CENTAUR second-stage booster rocket, and the Navy for shipboard installations.

The first important system, then, to be put through the research and development paces is the Army-developed COURIER, a delayed-repeater type of an active relay system. The designation COURIER is descriptive of its operational scheme for it is truly a space-age messenger as it travels at altitudes from over 500 to 650 nautical miles in an orbit calculated to make several passes a day over the transmitting and receiving stations at Salinas, Puerto Rico, and Fort Monmouth. As COURIER comes in view of the Salinas mobile ground station, the satellite's microwave transmitters and receivers are activated by command from the ground.

During the 5-minute "pass" period, information is sent to and received from the satellite. The information previously stored by the ground station

is on magnetic tape in digital form which allows a tremendous number of messages to be sent in a burst fashion in an extremely short time. In one pass, for example, 340,000 words or the equivalent of the contents of the Sunday edition of the *New York Times* can be transmitted and received by the tape recorders in the satellite. That amounts to over 1,400 words per second—a far cry from the "wigwag" flags and the pigeons of the past and even the systems in operation now.

Recent results from COURIER as of Oct. 20 show a total of 119 usable orbits with excellent operating statistics for the satellite and for the communications system. Voice, facsimile and digital modes have all been most successful and practically no difficulties have been encountered. The battery continues to be recharged, as designed, by the power generated by the 19,000 solar cells covering the spherical satellite. The thermal balance within the sealed satellite is proper in spite of the temperature range from a low of -19 degrees F. on the outside skin to 61 degrees F. in the batteries.

The satellite communication system offering the most advantages would be one that stations a series of satellites in relatively fixed positions over points on the earth so that messages could be instantaneously relayed from a ground transmitter to a satellite and back to another ground receiver thousands of miles from the first station. How can this be done? By placing a satellite in an extremely high orbit with the necessary velocity to match the speed of rotation of the earth so the satellite would appear to be fixed in space when viewed from the earth.

This is the so-called 24-hour satellite that completes one revolution around the earth in the same time period that a point below it on the earth completes one revolution in space. As a result, such a satellite system dramatically provides a working substitute for radio towers and the ionosphere, which have seen such stalwart service since the invention of the wireless by Marconi.

The Army is making another major contribution to military communications with just such a system through Project ADVENT, designed to position a microwave communications relay package 19,300 nautical miles above the earth in a 24-hour orbit. ADVENT has been described by some engineers as more complex than the development of ICBMs; its objective of determining the feasibility of this type of communication system will certainly have national and international significance, as well as direct military advantages.

Such a space relay station will be an active repeater because teletype, telephone, TV or facsimile messages sent to the satellite will be instantaneously relayed to another station

on land or at sea, as much as 10,000 miles from the originating station.

ADVENT is a great technological challenge to the military, science and industry. It will be the forerunner of space platforms that hover above various parts of the earth performing a variety of missions for mankind on earth as well as for the future voyagers in space. Here are a few of the interesting effects that must be overcome at that 19,300-nautical-mile altitude; solar and lunar perturbations on the satellite; the degradation of materials caused by radiation, unusual temperature ranges, and high vacuum—where materials like teflon sublimate.

The Army has a unique job to perform in this space field because it involves the management and supervision of the efforts of an unusually large number of military and national organizations as well as broad investigations into most scientific disciplines.

The use of satellites for communication is the first of the space projects that really contributes significantly to the Army role. Communication satellites promise more reliability, long-term reduction in costs, and a capability to exert the kind of command and control necessary for the ambitious new concepts deploying small dispersed forces over a large land area or for maintaining contact with STRAC on another continent.

Far from avoiding the new medium of outer space, the Army is exploiting its potential with the satellite communications systems, COURIER and ADVENT. If moving and shooting are geared for the atomic age, we are elevating communications to the space age!

Johns Hopkins Adds Two Distinguished Scientists to Staff

Distinguished recent additions to the staff of The Johns Hopkins University, Operations Research Office, Bethesda, Md., are Dr. Irving Siegel and Mr. Marvin Hoffenberg.

A member of the President's Council of Economic Advisers for the past seven years, Dr. Siegel will specialize at ORO in economic and productivity research studies, as will Mr. Hoffenberg. Dr. Siegel was chairman of special productivity studies for ORO, 1949-1951.

Prior to assuming his duties with the Executive Office of the President, Dr. Siegel had been Chief Economist for the Veterans Administration under General Omar N. Bradley, Assistant Chief of the Productivity Division, Bureau of Labor Statistics, and Director of The American Technological Study, 20th Century Fund. During World War II he served

Cm/C Scientist's Research May Help Save Lives of Thousands of Newborn Infants

Strides toward overcoming a lung deficiency that annually snuffs out the lives of 25,000 newborn babies in the United States have been made by a U.S. Army Chemical Corps scientist working with a team of pediatricians at the University of California Medical Center in San Francisco. The U.S. Public Health Service helped support research.

Lung collapse and resultant suffocation, a frequent cause of infant mortality, has been the subject of a special study at the University Medical Center's famed Cardiovascular Research Institute.

Dr. John A. Clements, on leave from his post as a pulmonary physiologist at the Army Chemical Research and Development Laboratories, Army Chemical Center, Md., conducted the research during the past year in collaboration with Dr. Karl Weaver of Baltimore, a University of Maryland pediatrician, and Drs. William H. Tooley and Marshall Klaus of the University of California. Dr. Clements recently reported their findings to the American Physiological Society.

For Dr. Clements it was a continuation of his work on an unnamed protein material which normally forms a film-like "lining" in the air sacs of the lungs and diminishes their natural tendency to collapse. Secreted from the lungs, this material is necessary to prevent infant suffocation. Among many newborn

babies, particularly the premature, the material does not develop early enough to sustain life.

Discovery of the "lining" was made by Dr. Clements and his coworkers at the Army Chemical Center several years ago while seeking new techniques of treating effects of inhaled toxic chemicals. The investigations at the Cardiovascular Research Institute, however, succeeded in further characterizing the material and concentrating it in the form of a fine white powder. Efforts now will be made to determine whether the concentrated material can perform the same lung-supporting function as the natural secretion.

Dr. Clements visualizes the possibility of administering the protective material to the lungs in the form of aerosol spray to coat the air sacs until the child's natural ability to produce the secretion takes over.

Further investigation is expected to uncover more information about make-up and characteristics of the secretion, obtainable from a wide variety of mammalian species. The studies in California, using beef lung as a source, have suggested that it is a lipoprotein material. Dr. Clements said it acts much the same as a washday detergent which breaks up the surface tension of water, making it soak into the fabric.

The lung "lining" material acts similarly to ease the surface tension in the air sacs, inhibiting their tendency to collapse; it also appears to provide an elastic quality that helps to stabilize the sacs.

as a Pfc (Private First Class) with the 13th Armored Division.

Mr. Hoffenberg formerly was a Director of Research, Economics Consulting Department, de Vegh & Co., an Economic Consultant with the Norwegian Central Statistical Bureau in Oslo, Norway, and a Staff Economist for the Rand Corporation, Santa Monica, Calif. His former Government posts include Assistant Chief, Division of Inter-Industry Economics, Bureau of Labor Statistics, and Consultant for The Marshall Plan in Paris, France.

Dr. Siegel has a B.S. degree from City College of New York, an M.A. degree from New York University, and a Ph. D. degree from Columbia University. He is a Fellow of the American Association for the Advancement of Science, the New York Academy of Science, the American Statistical Association, and a member of Phi Beta Kappa and numerous professional societies.

Mr. Hoffenberg has B.S. and M.A. degrees from Ohio State University, where he was both a University and a Stillman Scholar. He is a Fellow of O.S.U. and of The American Association for the Advancement of Science.

TC Testing Amphibian Designated as LARC-5 For Quantity Purchase

Results of intensive tests of a new all-aluminum amphibious cargo carrier with a 5-ton payload capacity and the ability to negotiate in heavy surf will be evaluated, with a view to quantity procurement, during January-March, 1961.

Designed and developed through the prototype phase by the U.S. Army Transportation Corps, under the guidance of the COT, Maj Gen Frank S. Besson, the amphibian is known as the LARC-5 (Lighter, Amphibious, Resupply Cargo). It is 35 feet long and 9 feet wide, with a single 270-horsepower engine located aft and controls forward. With its marine configuration, the unit features simplicity and ease of maintenance, and greater speed.



Burn casualty is loaded aboard a specially equipped plane that will transport him to the Brooke Army Medical Center at Fort Sam Houston, Tex., for medical treatment.

Bacteria that attack burn victims are isolated, identified and tested against virtually every available antibiotic by scientists of the Surgical Research Unit at Brooke A.M.C.

Brooke AMC Pioneers in Treating Burns

Crippling, disfiguring or fatal burns are among the tragic afflictions mankind has suffered through the ages without finding dramatically effective remedies—now the objective of Army research at one of the world's renowned medical centers.

Brooke Army Medical Center, Fort Sam Houston, Texas, is devoting its major research efforts toward discovery of life-saving, pain-easing, hope-giving marvels of modern science for the many thousands each year who become burn victims—and is seeking to minimize the possible catastrophe of nuclear war.

The U.S. Army Surgical Research Unit was established in August 1945 to conduct research in traumatic surgery. Burn injuries come under this heading. Ever since 1946, when the Unit moved from Staten Island to the Brooke Army Medical Center, it has concentrated on burn injuries—so successfully it has gained recognition in both civilian and military circles as one of the world's outstanding centers for burn treatment.

Gone are the days when the typical treatment for burns was a generous application of tallow, egg yolk, or blotting paper soaked in molasses. Doctors have learned that such treatments are useless and often harmful. Long strides have been taken through research toward scientific remedies, but treatment of burns remains shadowed by great mysteries for which no plausible explanation appears near at hand.

From World War I to World War II, battle casualty deaths attributable to burns increased significantly. Then came the tragic toll of Hiroshima and Nagasaki. The terrible burns that covered 60 to 80 percent of the survivors underscored dramatically the need to

know more about this type of injury. In nuclear warfare, it was evident, burn injury would probably be the greatest single cause of casualties.

Ten years ago the Surgical Research Unit at Brooke AMC made one of its first major contributions toward more effective treatment of burns by pioneering the "open" method, originated in England. Less painful and more rapid recovery resulted in a majority of cases.

The "open" method requires treatment of the body as well as the burn. While the burned area, at first, was left open to form its own scab, the body was plied with antibiotics, whole blood, morphine and special high calorie foods. Doctors have modified the original treatment by using very light bandages over the burned area.

Today the Surgical Research Unit's major battle is against bacteria—pinpointed scientifically as the greatest single cause of death in burn patients. Most burn deaths about 10 years ago occurred soon after injury because of shock and losses of body fluids. Replacement of body fluids through intravenous solutions, forced feeding of high calorie diets and various other methods, doctors learned, often only prolonged the patient's suffering.

The patient lived longer only to be attacked by staphylococcal and pseudomonas bacteria which cause "blood poisoning." While pseudomonas infections have proved more dangerous, almost invariably causing death, problems of staph infection are nearly as serious. Existing biotics can save only about half of staph patients. Investigators at Brooke AMC, and at Walter Reed Army Institute of Research in Bethesda, Md., are searching for new

drugs to combat more effectively staphylococcal bacteria.

In the absence of effective antibiotics, the Brooke AMC Surgical Research Unit has learned that the surest way to control bacterial infection is to cover the burned area with skin grafts, usually calling for great surgical skill.

The Unit has conducted extensive research with homografts—skin grafts taken from other people—which have "done wonders" in protecting burned tissues from bacterial invasion. Older methods left the patient extremely susceptible to bacteria for about six weeks, because the burned area had to slough dead tissues before skin grafts could be applied.

Homografts, so far, have been successful only as a temporary covering until sufficient grafts of skin taken from the patient's body could be used. Army investigators and civilian contractors are trying to learn why homografts will last only two to eight weeks normally yet survive indefinitely between identical twins. Through related studies they are seeking a physiologic membrane that will act as a burn coverage until the injured area can be covered permanently with autografts.

Excision of burned tissues followed by early grafting is a technique which the Brooke AMC Surgical Research Unit has tried with varying success. While encouraging, results have not proved sufficiently conclusive to warrant general adoption. Still, burned hands have been helped toward return of their former functioning through removal of deeply damaged flesh two to three days after injury and covering the area with skin grafts.

Studies of the survivors at Hiroshima and Nagasaki showed that some deaths could not be explained by burn injury alone—that two to six times as many deaths were due to combined radiation-burn injuries as compared with deaths caused by either injury alone. Radiation exposure lowered body defense mechanisms and provided a fertile field for invading bacteria. The problem: Find a way to cover the burned area and bar bacteria or to treat radiation injury so body resistance is not lowered.

Other Brooke AMC investigations seek improved treatment during the critical first 72 hours following major burns. Patients with burns covering more than 25 percent of their body surface nearly always go into shock. Since first aid to burn injuries in combat is necessary, and rapid replacement of body fluids using current methods is difficult on the battlefield, the Army needs many answers in this area.

Medical science needs to know how the blood volume in the burned patient behaves, and how body organs respond to burns. The Surgical Research Unit is studying effects of environmental factors such as temperature and humidity on the patient before and after injury. The best possible intravenous solution to replenish body fluids lost through burn injury is an urgent research need.

Continent-wide flying ambulance service is operated by the Unit in cooperation with the U.S. Air Force. A team of burn experts can take off within two hours after receiving a call from a physician attending a critically injured military man or his dependent. Burn experts rushed to Texas City during the 1947 disaster, and were on hand within hours after the 1958 Our Lady of Angels School fire in Chicago.

The progress made in burns treatment cannot be measured in comparative mortality statistics. More pertinent is the fact that patients suffering the worst possible burn injuries are able to recover more quickly, with less pain, and with fewer scars than ever before. In 1944 almost none of the patients survived when 33 percent or more of the body surface was covered by third degree burns, the deepest and most serious kind. Today patients with 60 percent of the body covered by such burns have a good chance of survival.

Still the thorny problem of bacterial infection haunts burn researchers. The potential danger of combined radiation and burn injuries in nuclear war spells out insistently the need for intensive and sustained research. Results so far have been rewarding enough only to warrant a far-in-the-future hope that burn injuries will not take such a high toll in human life and suffering.

Head Tilting Enhances Rescue Breathing

Mouth to mouth rescue breathing, endorsed in 1959 by the American Red Cross, is simpler and more effective with a new "head-tilt" technique developed and tested by an international group of researchers headed by Dr. James D. Elam, a former medical officer of the U.S. Army Chemical Research and Development Laboratories (USACRDL), Army Chemical Center, Md.

Dr. Elam, now Director of the Department of Anesthesiology at the Roswell Park Memorial Institute, Buffalo, N.Y., was prominently identified with early study of rescue breathing, much of it conducted at USACRDL in cooperation with The Army Surgeon General.

The research team credited with the head-tilt technique included Dr. John A. Clements, USACRDL; Dr. Robert F. Hustead and Dr. Donald W. Benson, The Johns Hopkins University School of Medicine; Dr. David G. Greene, Ros-

well Park Memorial Institute; Dr. Max A. Schneider, University of Buffalo School of Medicine; Dr. Archer S. Gordon, Los Angeles Children's Hospital; Dr. Henning M. Riben, The Finsen Institute, Copenhagen, Denmark; and Fr. Arne Ruben, Central Hospital, Kariskrona, Sweden.

The *Journal of the American Medical Association* recently published the team's report on the method and advantages of head-tilt oral resuscitation, stating, in part:

"All of the objections to the previous technics have been overcome with the head-tilt method of resuscitation, particularly when first preference is given to the nasal route of inflation of the victim's lungs. Gastric inflation by this route is negligible or absent, apparently a result of the resistance to airflow through the nose. Whether the nose or mouth is used, leakage is not a problem. During mouth-to-nose breathing, the victim's mouth is held closed. During mouth-to-mouth breathing, the rescuer presses his cheek against the victim's nostrils, if necessary, to prevent leakage. . . .

"Experience has shown that the head-tilt method can be taught and practiced in a few minutes with minimal discussion of the anatomy of the air passages. Casual rescuers can easily remember the simple steps of tilting the head back as far as possible and inflating the lungs via the nose or mouth. . . .

"The head-tilt oral method fulfills the need for a simple and effective universal procedure for resuscitating children and adults. Maximal extension of the victim's head opens and keeps the air passages open by the simplest known maneuver without involving insertion of the finger or equipment into the mouth."

Instruction for head-tilt oral resuscitation:

1. Lift the neck and tilt the head as far back as possible by holding the crown of the head with one hand. Sufficient tilting usually opens the victim's mouth.
2. Pull the chin upward with the other hand. (X-ray studies show this action produces a wider open air passage than that of normal conscious subjects.)
3. Inflate the lungs via the nose or mouth or, in an infant, through the nose and mouth.
4. Then remove your mouth to let the victim exhale passively. If necessary, let him exhale through his mouth by momentarily separating his lips.

Lectures Arouse Interest Of Top Science Students In Army Career Program

Stimulation of interest among outstanding science and engineering students in career opportunities presented in the Army's increasingly comprehensive research and development program is being accomplished in numerous ways and is encouraged by Army R&D leaders at all echelons.

Typical of the approach to this objective is the series of lectures being given by many of the nation's top scientists from universities, colleges and industries for selected high school students in the Fort Knox, Ky., area. The series is cosponsored by the Armor Human Research Unit, the Army Medical Research Laboratory and the Kentuckiana Chapter of the Association of the United States Army.

Outstandingly successful when initiated a year ago, with about 45 exceptional students participating, the lecture series for the current year is attracting more students from a wider area. Programs began Oct. 10 and will continue every other Monday through Apr. 17.

Lectures cover physics, medicine, archeology, psychology, electronics, geology, botany, engineering, sociology and chemistry. Each lecture is followed by a question and answer period.

Dr. Norman Willard, Jr., Director of Research at the Armor Human Research Unit, has announced that "the practice of awarding certificates of recognition to those students who successfully complete the seminar will be continued."

"For 136 years now, the same Army which defends us from military aggression has also been working to protect our people against costly floods which destroy life and property, and to develop our water resources for the utmost good of the Nation." Secretary of the Army Wilber M. Brucker.

Restriction Eased On Procurement of 'Official' Reprints

Solution of a problem under continuing study since 1956 establishes procedures for more expeditious and economical procurement of reprints of "official" articles authored by Army R&D personnel and published in recognized scientific or professional journals.

Procurement procedures are outlined in R&D Directive No. 310-2, dated Oct. 1, 1960, superseding R&D Directive No. 10, dated May 1, 1959. The most significant procedural change, contained in paragraph 6, provides for the use of Research, Development, Testing and Evaluation funds or contract field printing funds for procurement of reprints conforming to stated provisions. Direct procurement from the publisher is authorized.

The new directive states, in part:

"Articles written by Department of the Army personnel, civilian or military, and published in recognized scientific professional journals are considered unofficial if the authors have written the articles and dealt with the journals as private individuals. Such articles are unofficial even though the authors have been permitted and encouraged by their official supervisors to write the articles about work done as part of their government activities."

"Articles prepared at the direction of the author's official supervisor, or as part of the author's official duties, are official."

"Dissemination of the results of scientific research is an important aspect of the research process, and it is the policy of the Department of the Army to permit and encourage its personnel to prepare such results for publication in recognized scientific and professional journals. Publication in this manner is authorized in order to make these results known to scientific research agencies both within and without the Government for the benefit of the national defense effort and the public welfare. . . ."

"Prior to submission of research results for publication in scientific or professional journals, these results will be reviewed to determine: (1) that they are of significance and of value to the scientific community, (2) that military security requirements are complied with, and (3) that the release of such results is in accordance with pertinent regulations. . . ."

R&D Directive No. 310-2 is the result of united and diligent effort by the Chiefs of the Technical Services and the Chief of Research and Development



This balloon-like portable hangar, designed for field maintenance of Army aircraft, is under test at Fort Rucker, Ala. It consists of a light metal frame covered by neoprene-coated nylon fabric, inflated by a high-volume blower.

Accordion Portable Hangar Receiving Field Tests

A blimp-type portable hangar designed for field maintenance of Army aircraft is under extensive tests.

Originated by the Quartermaster Corps, the semioval structure stands 36 feet high at center, is 80 feet long by 72 wide and is supported by a semi-rigid, prestressed steel frame. Weighing some 7,400 pounds, the entire unit can be transported in reusable shipping containers by one 2½-ton truck or a cargo aircraft.

Assembled "accordion fashion" on the ground, the frame is covered by an opaque, neoprene-coated nylon fabric, which is inflated by a small high-

volume, low-pressure, air blower. When opened to receive rotary and fixed-wing aircraft, the structure loses air pressure and is supported temporarily by the frame.

With auxiliary heating, the new shelter permits maintenance at temperatures ranging to 60 degrees below zero and is designed to withstand 60-mile winds and gusts up to 75 miles per hour. Under adverse weather conditions, internal air pressure stabilizes the fabric and relieves the light frame of wind and snow loads.

Simplicity of design eliminates the need for heavy framework, shortens erection time and reduces the number of men required for assembly of the hangar. Tests point to its use also as a field bakery, a theater, warehouse or recreation center.

Engineers Test Field Unit To Produce Anesthetics

Army engineers are testing a portable anesthetic producing plant for possible use by combat medical units.

The plant, with a capacity of generating 40 pounds of liquid nitrous oxide an hour, consists of two skid-mounted units that can be carried by truck, train or plane. The units are bridged by a specially designed plastic bag providing 300 cubic feet capacity. It weighs only 30 pounds.

If accepted, the plant would minimize, if not entirely eliminate, the need for shipping returnable cylinders of compressed gas to and from theaters of operations. Army engineers said it is expected to reach the field in 1962.

to facilitate the dissemination of results of scientific research sponsored by the Department of the Army and to provide Army scientists and engineers the same opportunities for professional recognition accorded other scientists.

CmlC Lab Redesignated Without Other Changes

Expanding importance of its functions is recognized in the recent establishment of the U.S. Army Chemical Corps Nuclear Defense Laboratory as a separate element of the Chemical Corps Research and Development Command.

Personnel strength and location of the Laboratory, as well as its component branches—Evaluation, Nuclear Chemistry, Nuclear Physics, Radiation, Engineering, and Support—are unchanged by the organizational shift. The unit was formerly known as the Radiological Laboratory and functioned as an element of the CC R&D Laboratories.

Maj Heber C. Brill commands the Laboratory. A graduate of the United States Military Academy, he formerly served as a nuclear advisor at USCONARC Headquarters.

Project WOSAC Ends Having Accomplished Atomic Clock Timing

Completion of the third and main phase of Project WOSAC, an Inter-Service experiment directed toward worldwide synchronization of atomic clocks, is reported by the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J.

Target of the project was to demonstrate feasibility of clock synchronization to one microsecond, and better, over distances of several thousand miles. Studies were undertaken by USASRD in close cooperation with Prof. J. A. Pierce of Harvard University, the U.S. Air Force Rome Air Development Center, the U.S. Naval Electronics Laboratory and the British Post Office.

Project plans divided the experiment into: (1) synchronizing an atomic clock mounted in an airplane with the master clock; (2) synchronizing all "slave" clocks with the flying clock; (3) maintaining synchronization of slave clocks through phase tracking of VLF transmissions controlled by the master clock.

The master clock established on June 14, 1960 in the Rome Air Development Center (RADC) consisted of four Atomichrons and numerous dividers, phase detectors, recorders and receivers. Equipment was operated from both commercial power and generator power to minimize possibility of failure. This clock controlled the VLF Navy transmitter at Forrestport and measured Navy transmitters located in Hawaii and Balboa; it was operated continuously from June 28 through July 24.

Additional equipment was mounted in a KC-135 jet tanker (military version of the Boeing 707) supplied by RADC.

Test flights covered 45,000 miles (72,000 kilometers). Checks were made of the Atomichron NC2001 under rough flight environment, of the reciprocity law for VLF propagation in both north-south and east-west directions, measurements of distances in electromagnetic units, and clock synchronization.

New R&D Speech Directive

R&D Directive Nr. 5550-1, dated Nov. 2, 1960, requires prior review within the Technical Liaison Office, OCRD, of all speeches or presentations on R&D matters to be made in foreign countries by Army personnel. It states, in part:

"Chiefs of agencies will insure that personnel under their control who plan to make presentations overseas submit a proposed draft, through established channels, to the TLO, OCRD, in sufficient time to allow at least 10 working days for the OCRD review."

Problems Outlined in 8-Volume Guide

Adequately informed regarding requirements, the civilian scientific community will work much more effectively toward achievement of Army Research and Development Program objectives in building the Nation's defenses.

Information supporting this conviction of program leaders is currently being disseminated in the 8-volume *U.S. Army Research and Development Problems Guide*, a composite effort of all seven Technical Services compiled and published by direction of the Chief of Research and Development.

The Guide is intended to give industries, universities, colleges and nonprofit scientific institutions or activities proper cognizance of research and development areas in which they may have a capability for investigation. As stated in part in a foreword by Lt Gen Arthur G. Trudeau, Chief of Research and Development:

"... I am confident that none of our problems, given sustained attention, is impossible of solution. We are calling certain of them to your attention because I believe your organization has the ability, background and desire to help. . . . What we are looking for are scientific and technical wonders—major and minor. . . ."

Volume VIII, a consolidation of se-

lected unclassified basic research problems contained in the other seven volumes, and supplemented by problems in this category listed by Army Research Office analysts, is designed primarily for universities, colleges, and other nonprofit basic research activities.

Volumes I through VII are intended primarily for industry. Requesters must include proof of security clearance, if required, and a statement of the company's research capability in the field covered by the requested volume.

More than 7,000 copies of Vols. I-VII have been distributed to industry. Distribution within the Department of Defense has been completed to the Commandant of the Marine Corps, Chief of Naval Operations, Chief of Staff of the Air Force, and within the Army to combat development agencies.

Volume VIII, compiled by the Army Research Office, separates basic research areas according to scientific discipline, gives the name of the Technical Service(s) immediately concerned, and furnishes background information and requirements for research. A total of 330 problems are listed in the major fields of the physical sciences, life sciences, environmental sciences, and the psychological and social sciences.

U.S. Team Uses Army Device in Thailand Studies

Nutritional studies in Thailand are utilizing new body volume measuring equipment designed and constructed by the Physiology Division of the Army Medical Research and Nutrition Laboratory at Denver, Colo.

Sent to Bangkok by the U.S. Government at the request of the Government of Thailand, under the Mutual Assistance Program, a nutritional assessment team has employed a device called a volumeter in a testing program among native military personnel and civilians.

The program is scheduled to be completed this month, as far as the U.S. team is concerned, but Thais have been trained to continue the program, using the American equipment. The study is aimed at findings to permit correction of dietary deficiencies.

The volumeter measures the human body volume and composition. Measurements are based on the displacement of water in a calibrated tank when a man is lowered into the volumeter. The purpose is to determine the amount of body fat, which provides a key to the man's nutritional status and needs under varied conditions of climate and energy expenditure.

The device measures body fat with an accuracy of within one kilogram and has the advantage of being port-

able; two men can carry it empty. Its simplicity and rapidity of operation—less than five minutes are required to measure a man's volume and lung capacity—make it ideal for field use when large numbers of measurements are required. It can be operated by soldiers, or others, trained in its use.

The American team's trip to Thailand was made under the auspices of the Interdepartmental Committee on Nutrition and National Defense, composed of representatives of the Department of Defense, Department of State, Atomic Energy Commission, International Cooperation Administration, Department of Agriculture and Department of Health, Education and Welfare.

SC Project Directed Toward Marines' Need

A lightweight, man-packed facsimile system for field use is under development by the U.S. Signal Research and Development Laboratory to meet requirements of the U.S. Marine Corps.

Designated Facsimile Set AN/GXC-5, the equipment is intended for use in transmitting and receiving typewritten, printed or handwritten copy, sketches, overlays, charts and forms during reconnaissance operations.



Simulated downwash of VTOL (Vertical Takeoff and Landing) aircraft is provided by truck-mounted fan in study of erosion of unprepared surfaces.

Research Aimed at Cutting VTOL Surface Erosion

One of the important problems raised by operation of VTOL (Vertical Takeoff and Landing) aircraft and helicopters from unprepared surfaces is the erosion and dust created by the downwash or slipstream of the aircraft. Erosion may render landing fields unsuitable for further use and dust may interfere with the operation of the aircraft engines.

Under contract awarded by the U.S. Army Transportation Research Command, the Hiller Aircraft Corporation of Palo Alto, Calif., is making a study to determine VTOL effects on various earth surfaces and water. The U.S. Army Engineer Waterways Experiment Station (WES) assisted in the field testing phase of this study during the period May 24 to Sept. 23, 1960 by providing a range of earth materials for testing and the data to describe the soil conditions prevailing in the tests.

The test apparatus is a 2-foot-diameter ducted fan that can be adjusted vertically and angularly to simulate downwash impingement from a

wide range of aircraft. Attachment of the test apparatus to a military truck (see photo) makes it flexible and mobile. Tests have now been completed on silt, clay, sand, and gravel surfaces of various degrees of firmness and surface cover.

Preliminary analysis of the data obtained, an Army official said, indicates that the study has proved worthwhile and will be of great value to designers of VTOL aircraft and helicopters expected to operate from unprepared surfaces.

VTOL Escape Seat Tested; Usable up to 10,000 Feet

A lightweight, rocket-powered ejection seat for emergency exits from Army vertical takeoff and landing (VTOL) research aircraft is in the testing stage.

Ejection seats previously developed have proved effective only when the aircraft is in forward motion or has sufficient altitude to provide parachute opening clearance.

Operable without forward motion and designed for safety at any altitude up to 10,000 feet, the new ejector is a product of the Columbus, Ohio, Division of North American Aviation, Inc., under Army contract. Equipped with a quick-opening parachute, its total weight is 68 pounds, half that of similar escape devices.

SC Scientist Awarded Secretary of the Army Fellowship for 1 Year

Atmospheric turbulence, believed by scientists to be the dominant control in many physical phenomena, is the subject of a year's research at The Johns Hopkins University by Mr. Abraham Arnold, atmospheric physicist with the U.S. Army Signal Research and Development Laboratory at Fort Monmouth, N.J. Mr. Arnold has undertaken his research under a Secretary of the Army Research and Study Fellowship, the fourth to be awarded to a civilian at Fort Monmouth.

Phenomena in which atmospheric turbulence is the dominant control include optical seeing (scintillation) in the visual and infrared regions, acoustic transmission, dispersion of rocket and conventional artillery, air pollution, dispersal of gases or other contaminants, spread of radioactive particles, and the operations of a nuclear reactor.

Mr. Arnold is the author of many papers on meteorological phenomena, including "Turbulence in the Stratosphere" (1954) and "Variability of Ballistic Meteorological Parameters" (1957).

SC Awards 4 Contracts For Electronic Devices

Quick fabrication of radar equipment, including an adaptor to convert data received by radar into video form for transmission to a data processing center, is called for by one of four contracts totaling \$803,000 awarded to Electronic Defense Laboratories of Sylvania Electric Products, Inc.

Another of the contracts, all awarded by the U.S. Army Signal Research & Development Laboratories, Fort Monmouth, N.J., calls for construction of specialized scatter-communication equipment for field testing by the Signal Corps. An extension of research in electro-magnetic wave scattering, this project covers study of the effect of dense gases on microwave propagation, practical applications of which include communication with satellites.

The other two contracts cover research and analysis relating to electronic warfare conditions.

Detector Camera Sought

Development of a gamma ray "pin hole" camera and televisual device for detecting nuclear radiation is the goal of the Nuclear Corporation of America, under a U.S. Army Signal Corps contract.

WRAIR Unit Redesignated

Army Regulation 40-25 spells out the mission and organizational functions of the redesignated U.S. Army Environmental Hygiene Agency (USAEHA), Walter Reed Army Medical Center, Washington, D.C., formerly the U.S. Environmental Health Laboratory.

Doubled Fuel Cell Research Indicated in Revised Report

Expenditures for fuel cell research within the Department of Defense indicate a virtual doubling of intensity of effort during the past 16 months in this area of "great potential" in the unconventional power source field.

Prepared by the Army Research Office, "Status Report No. 2 on Fuel Cells" is expected to be off the press in December. It will be available to the public, as well as all government agencies, and is a comprehensive compilation of information submitted by all known investigators.

Published in June 1959 to reflect all known fuel cell research in progress at that time in the United States and Europe, the first ARO status report was greeted with unparalleled response when placed on public sale. Approximately 2,500 copies have been sold through the Office of Technical Services, U.S. Department of Commerce, which said no other report of this type had ever created such a demand.

Industrial research is expanding in

the fuel cell field as major oil firms turn their attention to the possibility of developing hydrocarbon-air cells, as opposed to hydrogen-oxygen cells which have been the primary interest of most investigators heretofore.

Commenting on this shift of interest, Mr. Ernst M. Cohn, coauthor of the forthcoming ARO report, stated:

"In view of the large effort in basic research concerning reaction mechanisms, materials and fuel cell design, it is quite likely that operating hydrocarbon fuel cells, when developed, will be considerably different from presently available laboratory models."

No major breakthroughs or significant gains have been announced in recent months despite the intensification of effort, Mr. Cohn said. Newest idea is a hybrid battery-fuel cell concept utilizing a hydrogen-oxygen system.

Thirty-eight contracts awarded by Department of Defense agencies to commercial firms, universities and nonprofit research institutions are noted in the

new report. The Department of the Army has committed about \$1,750,000, the Navy \$1,500,000 and the Air Force \$1,000,000.

Four of the Army's seven Technical Services—namely, the Signal, Engineer, Ordnance, and Transportation Corps—are supporting fuel cell research, Mr. Cohn said. Named to succeed Dr. B. R. Stein, who was transferred to the European Research Office of ARO in June 1960, Mr. Cohn completed the revision of the fuel cell report which Dr. Stein, author of the original version, had started.

The wide range of interest in fuel cell research is attested by the fact that papers on the subject have been presented this year at conferences of numerous technical societies, including the American Society of Mechanical Engineers, the American Rocket Society, the American Nuclear Society, the Society of Automotive Engineers, and the American Chemical Society.

Provocative Ponderables

"If one is to succeed in the research business, a certain amount of frantic loyalty is required . . ." Dr. Dale H. Sieling, Scientific Director, QM R&E Center.

* * *

"An Army officer should not be afraid of anything—even a new idea." Secretary of War Henry Stimson (World War II).

* * *

"There are about 1,500,000 Americans who wear this Army uniform, full or part time. A real good idea from one percent—or even one-hundredth of one percent—could revolutionize land warfare." Lt. Gen. A. G. Trudeau.

* * *

"Current evidence indicates that a prepared nation *can* live through a nuclear war, frightful though such a war may be. It is important for this to be widely understood. Otherwise, we could fall prey to apathy and hopelessness, which could undermine our determination to uphold our cause. Nothing could be more unjustified." General Lyman L. Lemnitzer, Chairman of the Joint Chiefs of Staff.

* * *

"Four battalions of the Army's nuclear-powered Corporal Missile have a firepower equivalent to that of all the field artillery—some 350 battalions—that the Army assembled in World War II." Franklin B. Lincoln, Jr., Assistant Secretary of Defense (Comptroller).

New Solar Cell Hailed as Important Advance

Research efforts to harness the energy of the sun as a source of unlimited power for exploration of space frontiers have produced a new type of solar cell many times as long-lived and resistant to high energy ionizing radiation as current types.

Developed by the U.S. Army Signal Corps Research and Development Laboratories (USASRDL), Fort Monmouth, N.J., the cell is being acclaimed as the most important advance in this research area since the first solar cell was produced by Bell Laboratories and announced in a scientific paper in 1954.

Made by diffusing phosphorus into the surface of a "p-type" silicon crystal, the new cell is similar in appearance to present cells made by diffusing boron

into an "n-type" silicon crystal. Active silicon layers are reversed in the new cell.

Characteristics measured in radiation exposure tests by the RCA Laboratories, the Transatron Electronic Corp., and the Space Technology Laboratories indicate the new cell can withstand high energy ionizing radiation more than 10 times as long as current solar cells and is about four times more resistant. Tests used protons with energy of 740 million electron volts.

Other radiation-resistant electronic devices for military and civilian uses may be developed from knowledge gained in research on the new cell, conducted by a scientific team headed by William Cherry and Joseph Mandellorn of USASRDL, the Department of Defense stated.

Information on manufacturing techniques for the new solar cell will be made available to the U.S. electronics industry by the Department of the Army. The process is reported to cause less damage to the delicate internal crystal structure of the silicon, fewer rejections for spoilage, and cells of higher performance at lower cost.

Solar cell research, a USASRDL scientist stressed, is still far short of its ultimate objective of providing electrical power for many military requirements at reasonable cost and high reliability. Silicon is considered as a material likely to be displaced by others which current research indicates may possess much more desirable qualities.



Exposure tests of new type of solar cell shows it to be far longer-lived and resistant to radiation than current types used in space research.

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